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TRANSACTIONS

OF THE

TWELFTH ANNUAL MEETING

OF THE

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY

HELD IN

KANSAS CITY, MO.

June 11th, 12th and 13th, 1906.

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TRANSACTIONS

OF THE

TWELFTH ANNUAL MEETING

OF THE

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

Held in Kansas City, June 11th, 12th and 13th.

Address of the President.

It has always been the custom of this Association to hold its annual meeting in the home town of its presiding officer; but never before in its history has it been called upon to cross the eastern bank of the Mississippi River, and venture so far to the westward. The honor you have done me, gentlemen, is so much beyond my deserts that I will not even attempt to express my appreciation of it, but shall merely add to the words of welcome you have already heard, my personal heartfelt thanks for your kindness and courtesy, and my sincere hope that nothing will occur during your stay with us that will cause you to regret the unusual effort you have put forth in coming.

The holding of the twelfth yearly session of the American Laryngological, Rhinological and Otological Society in Kansas City not only marks an epoch in the growth of this young metropolis—of which we its citizens are so fond and possibly a trifle too proud—but it registers a long step forward in the development of our particular corner of the great field of medical science.

Scattered all over this wide Middle West, are scores of men, co-workers with us, bright, energetic young fellows, well equipped in the main and alive to their duties and their responsibilities who, nevertheless, are so deeply engrossed in the daily routine, so busy with the hard grind of general or special practice, that they cannot—or they think that they cannot—break away each year long enough to attend a medical convention in a distant city. They can come to us here, however, and to such men the presence of so large a body of distinguished specialists, of so many successful students of those same knotty problems with which they themselves are constantly wrestling, cannot fail to be a present inspiration and a permanent benefit.

The germ of enthusiasm is communicated most swiftly and unfailingly by personal contact. It is one thing to read in a professional journal a long technical article reporting the results of a series of tedious experiments, or to glance hastily through a pithy paragraph heralding a discovery, that may or may not be revolutionary in its consequences; it is another and a very different thing to listen to the voice of that same patient investigator as he rehearses, step by step, his cautious, but no longer tedious processes; or to catch fire from the spark that lights the eye of that one who has captured another of Nature's guarded secrets, or who has come out victorious in battle with another of humanity's dreaded foes.

So potent a factor do I regard this face-to-face encounter between soldiers fighting under the same banner, that I shall be as much surprised as disappointed, if many new names are not added to our roll-call as the direct result of this convention. Should that be the case, virtue, which is always a sufficient recompense, will not be its sole reward. These fresh, unworn recruits will not come to us empty-handed. They will give as well as receive. The infusion of new blood into our veins will necessarily show itself sooner or later in the greater vigor and activity of our whole body. We have heretofore largely increased our usefulness in this way, and perhaps no greater good has resulted—indirectly—from this organization that this opening up of new spheres of influence by means of our annual change of meeting place.

In reviewing the work of this Society during the few years of its existence, I find so many reasons for satisfaction—with ourselves—that I should not dare recite them all even right here in the family. I shall presently mention very briefly one or two things that seem especially to invite self-felicitation, but before doing so I must ask your consideration of some matters of practical business.

In pursuance of our policy of encouraging first-hand investigation within our membership, we have, as you know, recently set apart the sum of five hundred ($500) dollars, and have authorized the judicial committee to select from the material annually submitted to it, the article, monograph or volume which in its judgment shows most original research, and reimburse the author for the actual cost incurred in getting out his work.

This is a move in the right direction, but in my opinion the fund is insufficient for the purpose, and should as soon as prac-

ticable be substantially increased. With more money at their disposal, the judges could exercise some discretion as to the amount of reimbursement required in each case; and, besides putting a more liberal interpretation upon the rigid letter of their instructions, they could enlarge considerably the scope of the competition.

It goes without saying, that I am not proposing to pay the successful competitor for the time and labor expended. I should as soon think of suggesting that he be paid for the clear brain and the unselfish purpose that made that time and toil fruitful. That would be neither possible, nor in this case desirable. The pure joy of achievement, the calm pleasure that comes with the consciousness of a worthy task nobly done is—if not reward enough for any man—certainly reward enough for any member of that profession whose proudest distinction is that it puts the welfare of all so high above individual profit. But while I am far from wishing to dangle a money prize before the eyes of our ambitious and gifted brethren, I do not forget that on this particular planet at this particular stage of its social evolution, money is a very necessary evil, and doctors are not invariably multi-millionaires.

Scientific experiments ordinarily demand costly apparatus, and much material, and occasionally the expense entailed is so great as to be practically prohibitive. It is scarcely fair that he who so freely pours his best into the common treasury should be expected to do so at an actual financial sacrifice. We who share the benefit should in some measure share also the burden.

Closely allied with the subject of the fund is that of the Library. This is such a recent addition to the resources of the Association that it is entirely possible that some of you may be as yet unaware that we have a library to discuss. If that be the case, it gives me great pleasure to report to you that through the generosity and untiring efforts of Dr. Curtis and Dr. Harris there has gathered the nucleus of what we hope will in time grow into a complete and in some respects a unique collection of the latest and most valuable literature upon our especial subjects.

Henceforth it will be not only our privilege, but also our duty both as an organization and as individuals to foster in all possible ways this new enterprise. It may be made, and it should be made, a repository of all published matter bearing upon Rhinology, Laryngology and Otology, and as such will be

of invaluable assistance to any one wishing to keep himself fully abreast of the times.

Besides devoting much time and trouble to getting together the books, pamphlets and periodicals composing this collection, Dr. Curtis has set apart a room in his residence as a temporary home for it; and the matter now on hand is, I understand, being catalogued and indexed so as to be available for reference purposes to fellows of the Society.

Later on it should be possible for any member, no matter how far he may live from New York, to procure data by mail on the subject he happens to be investigating. But of course, before we can expect such practical results, we must relieve Dr. Curtis of the burden he has so unselfishly assumed, and ourselves provide permanent quarters for the collection. We shall then need a librarian whose duty it will be to facilitate to the utmost the use of the books, and who shall moreover be competent to make the necessary notes and excerpts for the benefit of those who must avail themselves of the resources of the library at long range.

There is one other project that I feel impelled to put before this convention. It has been often in my mind during the last few years, and now that I have such an excellent opportunity I cannot resist the temptation to spring it upon you.

It does seem to me, gentlemen, that the time has arrived for the American Laryngological, Rhinological and Otological Society to have an organ of its very own—a journal devoted exclusively to the special interests which it represents. I see nothing impracticable in such an undertaking, nor any reason why it should not mean for us as much as The Journal of the American Medical Association does to that body. We have a number of men who could edit such a periodical with distinction to themselves and to the Society; and surely there would be no lack of material. The list of contributors would include the most notable names in our ranks in Europe as well as in America, and such a periodical would be the natural and most efficient means of keeping us in touch with the latest discoveries in medical science, and the newest achievements in our own and cognate branches of surgery. It would present in a concise, readily accessible form reliable information which is now scattered broadcast through various publications, domestic and foreign. It would in consequence be a great time-saver, and that is no small merit in this over-worked age. Few of us have

the necessary leisure to search the mass of periodicals for the grains of wheat that lie hidden in the bushels of chaff.

Such a journal would immediately take its place as a recognized authority, and would be read by every laryngologist, rhinologist and aurist from the Atlantic to the Pacific. They could not afford to ignore it. I am firmly convinced that it would be self-supporting from the start, and as it would be the natural channel for the appearance of the Society's Transactions, it would save us cost of their separate publication which is no insignificant item in our yearly budget. Professionally we have all to gain, and financially there is little risk of loss in inaugurating this new enterprise. Now is the time, and Kansas City (which is a town of beginnings), is precisely the place to bring forth the young stranger for whom I predict a long, honorable and most useful career. I earnestly urge the matter upon your favorable consideration.

It is fortunate for us that there remains, and will always so, much to be accomplished that there can be no danger that the medical profession will be forced to stand still for lack of new worlds to conquer.

On the long, hard road "that winds uphill all the way" every height gained brings more plainly into view the limitless range of peaks yet to be scaled. Nevertheless, the knowledge that we have mounted so far gives us new strength and added courage to press on, and it is well to pause occasionally long enough to measure the distance over which we have lately come.

Twelve years ago, for instance, the science of Otology was, if not in its puling infancy, at least in its backward childhood. It had been traditionally associated with Ophthalmology, and as a result of this incongruous alliance, it had made little or no progress. This Society broke the hampering bonds, and for the first time recognized the natural affinity existing between Otology and Laryngology and Rhinology. Once started on the true road, aural surgery has since gone forward on seven-league boots. We may safely affirm that in no branch of the medical professional has such phenomenal advance ever been made as during the last decade in the surgery of the ear, the brain and the sinuses. And without boasting we can say that on this double-quick forward march the members of the American Laryngological, Rhinological and Otological Society have always been found in the van. No other organization of its age has such a record for original work, and no other has a more

earnest, devoted and courageous band of workers. It is largely owing to the labors of men in our association that American surgery holds the place it now occupies in the eyes of the world. It is no longer necessary as it once was for a young man seeking the best training to go abroad to study, although the added experience and the wider outlook still make such a course advisable when circumstances permit.

But nowhere on the globe can be found more skilful surgeons, more daring investigators or more capable, high-minded and self-sacrificing students of the great problems of biology and pathology than we have right here in our own ranks.

The rapid advance we have made is, however, necessarily attended with dangers. The pitfalls and hidden obstacles that lie in wait for the cavalry corps that attacks the redoubt in a sweeping gallop are no serious menace to the slow-moving infantry that plods after them. Like the famous general of old, the advance guard now and then marches up the hill and then marches down again with no tangible result except perhaps to send the pendulum swinging in another direction; and for this reason it may not be out of place to sound a note of warning.

Courage is a great and a glorious thing. A man who is not brave enough to take all unavoidable risks is not worthy of attaining a great goal. Courage, real courage, examines all sides of a question; it counts the cost carefully, and having once decided it goes forward without haste and without rest to a definite clearly foreseen end.

But between this true and wise courage, and that reckless daring that plays with human life as with a child's toy, that proclaims every operation a success no matter what becomes of the patient, there yawns a gulf as wide and as deep as that which divided Lazarus and Dives.

It sometimes requires less courage to operate than to refrain from operating. It is not always easy for the surgeon to wait until he is at least approximately sure he is right before he goes ahead. So many marvelous things have been done, so many marvelous things remain to do, that our own eagerness aided frequently by the ignorant over-confidence of the patient and of his anxious and well-meaning friends occasionally tempt us to radical measures that we live to regret.

Do not misunderstand me. I am not opposing progress. I am not advocating a return to the dark ages of surgery, when, for example, the bare thought of opening an abscess in the

brain would have frightened both the operator and the invalid into a premature grave; but I am pleading for conservatism in capital operations. Not all movement is forward motion. There is such a thing as going backward; and it is quite possible to keep up a show of violent activity by simply marking time.

Let us then first make sure that we are progressing, and then let us temper progressiveness with judgment. We are not primarily a band of scientists privileged to experiment on human beings to gratify a learned curiosity. We are first and foremost surgeons, and our paramount duty—I am not sure that I ought not to say our sole duty—is to relieve our patient.

With this word of caution, and conservatism, natural to the man who was born south of the Mason and Dixon Line, I will close and give space to others.

Gentlemen, allow me to thank you for your courteous attention and to express once more my pleasure at seeing you here.

PAPER.

OCULAR SYMPTOMS OF NASAL ORIGIN—REPORT OF A CASE OF RETROBULBAR NEURITIS AND OTHER ILLUSTRATIVE CASES.

HILL HASTINGS, M. D.

The comparatively recent studies of the accessory sinuses of the nose (notably those of Onodi, Killian, Hajek, Logan Turner, Cryer, Lothrop and Mosher) and the pathologic findings, largely the result of surgical interference in suppuration of these sinuses, have caused widespread interest in this field of surgical work. The accumulation of clinical experience in this region has increased with the rapidly spreading search to discover the seat of suppuration in cases of so-called "nasal catarrh." One result of this searching inquiry into nasal suppuration has been a partial realignment of the recently more or less disassociated specialties of ophthalmology and rhinology, in so far as greater attention is being paid to the causal connection between certain ocular symptoms and suppuration in the adjacent accessory sinuses of the nose. Aside from orbital abscesses that plainly point to the frontal sinus or anterior ethmoidal cells as the primary cause, there are other ocular symptoms resulting from disease of the deeper sinuses, namely, the posterior ethmoidal and sphenoid cells, which often cannot so easily be traced to their true source.

The association of the nervous and vascular supply to the eye and nose is readily seen by such common symptoms as the congestion of the conjunctiva in an ordinary "cold in the head," or conversely, the sneezing that often results from looking at the sun, explained through the nasal reflex from irritation of the ciliary nerves of the eye. Again, the frontal headache, eye-

ache and tired feeling resulting from use of the eyes during an acute coryza are commonly noted symptoms. That these ocular symptoms result reflexly from disturbances of the circulation in the acutely inflamed accessory sinuses of the nose seems evident from the aggravation of the same symptoms, even to the production of edema of the eyelids and severe pain in the eyes when the nasal trouble is more severe. It is immaterial whether the ocular symptoms result from actual obstruction in the anastomotic circulation between the eye and nose (as in the anterior and posterior ethmoidal vessels); or from a reflex through the fifth nerve to the sympathetic nerves which have vaso-motor control of the circulation of both the eye and the nose. The point that is meant to be emphasized is, that it is a generally accepted fact that certain ocular symptoms arise apparently reflexly from acute inflammation of the accessory sinuses.

If this is true in acute inflamamtion, it is equally true in chronic inflammation of these cavities. Here, as in the acute conditions, we may find orbital abscesses pointing to the associated chronic nasal suppuration when there has been a perforation by necrosis of the orbital wall of some inflamed accessory sinus. But also, as in the acute condition, we may find ocular symptoms, other than abscess formation, dependent upon chronic suppuration when no perforation has occurred. That these ocular symptoms are often not traced to their true source seems reasonable when it is considered how obscure are many cases of chronic suppuration in the deeper accessory sinuses, and how unlikely is the patient seeking relief from such a symptom as eye-ache to mention a "nasal catarrh" that he has had for years and never expects to be rid of.

Aside from the congestion of the mucous membrane lining these cavities, we have in chronic suppuration an additional cause for the reflex eye symptoms, namely, the overdistension of the sinus with pus. This may result from blocking of the small orifice of the sinus with a polyp or from swelling of the mucous membrane. That the obstruction is often but temporary in these chronic cases and recurs only on acute exacerbation of the inflammation is seen by the recurrence of the ocular symptoms when there is an aggravation of the "nasal catarrh." It is of course well recognized that there are many cases of accessory sinus suppuration in which drainage is

always good and obstruction never occurs sufficiently to cause symptoms. Artificially, as it were, the same symptoms complained of by the patient are sometimes produced by irritation of the accessory sinuses, when from the filling of the cavities with solution sufficient pressure or irritation occur.

The ocular conditions (other than orbital abscesses) most frequently met with that can be traced to nasal trouble may be enumerated as follows:

(1) *Edema of the Eyelids.* Frontal sinus suppuration should be suspected with or without perforation of its orbital wall, especially when the edema is unilateral. Where no perforation exists, the edema may result from obstruction to the venous circulation through inflammatory swelling of the muco-periosteal lining of the sinus. On securing good drainage through the naso-frontal duct in such cases, the edema quickly subsides. In acute cases, as is well known, shrinking of the mucosa of the middle meatus by cocain-adrenalin often opens up the naso-frontal duct, secures good drainage and relieves the symptoms.

(2) *Congestion of the Conjunctiva.* This symptom has been explained above as due either to actual venous obstruction or, and I think more correctly, as a vaso-motor disturbance reflexly produced through the fifth nerve. In this sense it is a nervous symptom and is met with in suppuration in any of the nasal accessory sinuses, as for instance, from the sphenoid alone.

(3) *Ptosis* (often slight). When ptosis is unilateral and is associated with "nasal catarrh," frontal sinus suppuration is to be suspected, on acount of the close anatomic relation of its lower wall to the levator palpebrae superioris muscle. The ptosis, however, is likely due to a paresis of the nerve filament to the muscle rather than due to an actual immobilization of the muscle through direct extension of the frontal sinus suppuration. (Case No. 1.)

(4) *Squint.* This is more likely due to a perforation of the orbital wall of the frontal or anterior ethmoidal cells with a formation of an orbital abscess and involvement of the muscles. In case No. 5, hereinafter reported, the muscular involvement apparently followed perforation of the antrum into the orbit. Posey states (Journal of the A. M. A., July, 1905): "I am of the opinion that if many of the cases of palsy of extra-

ocular muscles attributed to rheumatism were analyzed, an affection of the sinus would be found to be the underlying cause in many instances."

(5) *Pain in the Eye*, varying in intensity from slight eye-ache to very severe deep-seated pains in the eye and head, often unilateral and aggravated on use of the eye, points to disease of any of the accessory sinuses as a possible cause. It may be due to disease of the sphenoid alone (Case No. 2), in which event the pain is often described as "dragging pain in the eye" or "deep behind the eye" and may be accompanied by severe headaches lasting several days. In other cases "an aching and tired feeling in the eye" may be the only complaint. It is possibly true that many patients are refracted for eye-ache without relief because the seat of trouble in the nose was not found and treated. This is not at all improbable when we realize the great difficulty in diagnosis, especially when the sphenoid cavity alone is involved. (Case No. 3 is one in point.)

(6) *Disturbances of Vision* of nasal origin, due to suppuration in the posterior ethmoid cell or sphenoid cavity. The causal relation of disease of these cavities to disturbances of vision was thoroughly worked out by Onodi (Br. Med. Jour., Nov. 5, 1904.) by anatomic demonstrations and a searching review of the cases that have been reported. Onodi and others have shown that the inner wall of the optic canal, frequently formed by the posterior ethmoid cell or sphenoid cavity, is often thin as paper and occasionally shows dehiscences, so that an extension of the inflammation within either cavity to the optic nerve is easily possible. A retrobulbar neuritis may thus occur, resulting in atrophy of a part or all of the optic nerve and corresponding blindness. (Case No. 5 is one in point.) While this is doubtless rare, Onodi has been able to collect numerous cases. Temporary disturbances of vision are said to be more frequent; Posey ("The Ocular Symptoms of Affections of the Accessory Sinuses of the Nose," *Journal A. M. A.*, Sept. 9th '05) states that "edematous infiltration of the nerve is common. Although the change wrought in the nerve is but slight and the symptoms which it excites are not striking, they must be searched for with care."

Aside from these ocular symptoms, which are likely much less rare than is generally believed, numerous ocular conditions are ascribed to nasal sinus suppuration, the causal connection

possibly in some being far fetched. They have not been observed by the writer, nor would they likely be found by those of us who are not engaged in ophthalmologic work. Thus Posey in his instructive paper, referred to above, states that "Ziem, Fromaget, Fish and others have recorded a number of cases of uveitis due to sinusitis, and claim to have seen marked improvement in cases of this nature," also that "Ziem claims that cataracts may be occasioned by diseases of the sinuses"; that Kuhnt has frequently seen "spoke-like opacities of the posterior cortical layer in antral diseases," and that Batten-Fish considers sinusitis to be an "etiological factor in myopia."

Deaths from nasal sinus suppuration are very rare, and therefore opportunity seldom occurs for post-mortem examination of the diseased sinuses of patients who have suffered from associated ocular symptoms. Hence it is necessary all the more to depend on painstaking and often-repeated nasal examinations, if we wish to clear up a certain percentage of obscure ocular symptoms. Furthermore, now that the ophthalmologists have found it necessary to confine their study more and more to the eye, it is incumbent upon those of us who are not doing eye work to keep ourselves and them fully alive to the progress that is being made in this line.

It is hoped that the report of the following cases of chronic suppuration, which with the exception of the case of retrobulbar neuritis are by no means rare, may contribute if only in a small way to the interest in this phase of the subject:

Case 1.—*Ptosis of the Left Eyelid—Left Frontal, Antrum and Ethmoid Involved.*

Mrs. K—, age 26, was referred Jan. 7, '05, on account of "nasal catarrh" and pain in the left frontal region. She had had nasal discharge for years and a musty odor had been noticed, chiefly by her husband. No other symptoms were remarked until three months ago, when some dull pain and soreness of the left eye and drooping of the left eye-lid appeared. These symptoms had persisted although never severe. She was operated on four years ago, "a bone" being removed from the left side of nose. Otherwise she had had no treatment, except the routine use of a nasal douche. She came to California seven years before and believes some drying up of the nasal discharge followed.

Pus was found on the left side of the nose, in the middle meatus and on the floor. The anterior end of the middle turbinate had been removed and a scab was found adherent to the stump. On wiping this away the middle turbinate was found to be polypoid and pus slowly dripped down from the region of the naso-frontal duct. A cotton-wound applicator passed up rather easily into the frontal sinus, and was followed by a catheter. Some muco-pus was washed out. At a later sitting, the polypoid turbinate was removed and also several clear polyps. Diseased anterior ethmoid cells were removed little by little. Later the antrum was catheterized apparently through the natural opening and muco-pus washed out. The character of the antral secretion was in size and consistency like that of a large pulpy grape with some stringy mucus. A musty odor was apparent, especially on the first irrigation of the antrum and thereafter if the antrum was not irrigated for a week or ten days. There was never any foul-smelling cheesy detritus. After lavage of the cavities, attempts at drying were made by cotton applicators and by having the patient blow the nose with the head inclined to the opposite side. The right side of the nose was apparently not affected. After irrigating the frontal, a marked increase in the ptosis was apparent for a few hours. After four months' treatment, the pain and soreness passed off and the ptosis became barely perceptible. Several months later, the patient was quite comfortable, although she occasionally had a little soreness and a slight drooping of the eyelid, especially when she had a cold. The discharge had not been so bad nor so objectionable as formerly.

Case 2.—*Dull Pain in the Right Eye—The Right Sphenoid Involved.*

Miss K—, age 21, sought treatment Jan., 1905, for "nasal catarrh," "dragging pain" in the right eye and some congestion of the conjunctiva. (It was an interesting fact that the causal connection between the eye-ache and the nasal trouble was suspected by the patient for the first time on account of a short lecture given to a class of nurses, of which she was a member.)

The patient came to California three months before seeking treatment, largely on acount of the "nasal catarrh." The discharge began six or eight years before, had been constant from in front and behind, but only on the right side. She was quite

sure on this point. It was aggravated by a cold. Never any frontal pain or soreness, but dragging pain deep in the right eye had been more or less constant for three or four years and was worse when she had a cold. Of late it was increased on using her eyes, to such an extent that it was interfering with her studies. She was refracted about four years ago and had worn glasses for awhile without relief. No special nasal treatment had been given.

Examination negative; the nose was clean; there was no sign of sinus suppuration. The patient was advised to consult an oculist and to return if she felt an accumulation of discharge in the nose. A few days later she returned, saying she wished to prove that she was not a case of too active an imagination. Muco-pus was found on the floor of the right side of the nose, far back, and on shrinking the middle turbinate, a streak of muco-pus was seen coming from the region of the sphenoid ostium. There was no pus in the middle meatus and none in the left nasal cavity. The right antrum was punctured and irrigated to exclude that cavity, and to a certain extent to exclude the anterior cells above it. No pus was found. The middle turbinate was subsequently partially removed and the sphenoid ostium could be plainly seen with pus coming from it. Thereafter the ostium was enlarged and the sphenoid cavity regularly irrigated and as thoroughly dried as possible. On March 18 (in two months) the patient stated that the eye-ache had been absent for three weeks, and on June 1st that the eye had remained free of pain or aching even on reading—a relief not experienced for a year. She had not been refracted as requested. The discharge gradually decreased and by July 1st it had ceased. She felt cured. Two months later she again reported that she had remained well, and had done nothing in the way of treatment. She now was free of discharge and had not been sprayed or douched in two months. One month later, after "taking cold," the patient returned very much discouraged on account of the reappearance of the same troublesome symptoms, including the eye-ache, in spite of the fact that she had been refracted and glasses fitted. Several "gobs" of muco-pus were washed out of the sphenoid. The discharge gradually ceased again and the eye-ache and congestion entirely subsided in two or three weeks. On Jan. 5, '06 (about 11 months after the first open-

ing and irrigation of the sphenoid), the patient reported that she had had no discharge and no eye-ache since the last rather evanescent attack from the "cold," and except at this time she had had no treatment in six months. On April 1st, '06, she again reported herself as entirely cured. She was advised to report whenever she had a coryza.

In this case the causal connection between the ocular symptoms and the sphenoid trouble was most noteworthy. Additional evidence was furnished by the reappearance of the symptoms in the right eye on the recurrence of the inflammation of the sinus during a coryza, even after the correction of the eyes. The case demonstrated two other points: 1st—The difficulty of diagnosticating suppuration of the sphenoid alone, which may easily be mistaken for post-nasal catarrh. 2nd—The apparent cure of a chronic sinusitis of many years' duration by means of repeatedly irrigating and drying the cavity—a fact, of course, well corroborated in the experience of others.

Case 3.—*Eye-ache and Frequent Headaches from Sphenoidal Suppuration.*

Miss M—, age 30, referred Dec. 5th, '05, on account of nasal discharge of five years' duration, chiefly from behind. Used six or eight handkerchiefs a day, and had to leave the table almost every day on account of the post-nasal discharge. Every week or two, had severe aching in the eyes, at first only in the left eye, radiating to the ear, now more in the right eye; described as "deep behind the eye," never over the eye, and almost always ending in a severe headache. These attacks had persisted for ten years, and no relief had been found except the temporary relief from antikamnia, with which she keeps well supplied, and of which she claims to have taken 20 grains per day. She has been refracted six or seven times. She was treated for her nasal catarrh for several years without relief and came to California on account of the trouble. Four years ago, she was operated on by Dr. Bolton of Pasedena, to whom the writer is indebted for referring the case, and since then there had been considerable improvement. At the time of her operation, she was told that her trouble was in the accessory sinuses of the nose. The middle turbinate and much of the ethmoid labyrinth had been removed on both sides and the left sphenoid cavity was opened and repeatedly irrigated. She had lately been advised by Dr. Bolton that he suspected renewed

inflammation and possibly suppuration in the right sphenoid cavity, as the discharge had again increased. He referred the case on account of illness.

On examination it was seen that the inferior and middle turbinates had been partially removed, exposing the anterior surface of the sphenoid. The left ostium was plainly seen, and evidently had been enlarged. The cavity seemed dry. The right sphenoidal ostium could not be seen or felt, some bands of scar-tissue interfering. No pus appeared in the front of the nose on either side. Stringy muco-pus was seen clinging to the posterior naso-pharyngeal wall; its removal caused come gagging. The findings were thus not conclusive of present sinus involvement. Instead, a chronic post-nasal catarrh was regarded as the cause. At a later examination drops of pus appeared in the sphenoid-ethmoid niche on the right side. On removing some bands of scar-tissue in this locality, the sphenoid ostium came into view, and muco-pus was plainly seen coming from this cavity. The ostium was enlarged and the sphenoid regularly irrigated and dried. Still later, a fistula through the sphenoidal septum was found, proven by the introduction and touching together of two probes, one in each sphenoid cavity. Still later the adjacent posterior ethmoid cells were found diseased.

On Jan. 18th patient stated she had marked relief both in the decrease of the discharge and in the absence of eye-ache and headache; that she had gone over a month without headache, other than some headache on the night following the operation to enlarge the ostium—a relief not experienced in years and now had but little discharge and seldom the objectionable gagging attempts at its removal. The patient is still under treatment. April 1st, '06. The discharge has decreased, but not entirely ceased. The headaches, however, have never recurred.

Case 4.—*Neuralgic Pains in Eyes and Headaches—Chronic Suppuration of Nasal Accessory Sinuses of Both Sides, Associated with Atrophic Rhinitis.*

Miss B—, age 18, treatment sought Sept. 5th, '05, on account of "catarrh." Onset five or six years ago; remembered when the nasal discharge began, but not ascribed to any particular disease; in the beginning had severe pains over the eyes, occurring from time to time and requiring medicine to

give relief. The discharge has been constant, worse on right side, mostly from in front, with some odor, if the nostrils are not daily cleaned out, and worse when she had a "cold." No other symptoms except the dull frontal headaches.

Stringy muco-pus was found on both sides, in the middle and superior meatuses. The turbinates are moderately atrophied; pus is seen coming from the region of the naso-frontal duct on each side after being swabbed off; it reappears on blowing the nose. The nasal surface of the right sphenoid is seen to be covered with thick, red mucous membrane streaked with muco-pus. The ostium could not be seen until the mucous membrane had been well shrunken with cocain-adrenalin, when a dimple was apparent. A probe was introduced into this depression and dropped into the cavity; on its withdrawal a few drops of thick pus at once oozed out, a drop at a time, as fast as mopped away.

Operative treatment was advised and refused. Patient returned two months later, Nov. 6th, with complaint of pains over both eyes, and dull headache for a week. The same conditions were seen as at the previous nasal examination.

The right middle turbinate and much of the ethmoid labyrinth were removed and the ostium of the sphenoid enlarged. The patient is still under treatment (April 1st, '06,) and is much improved, claiming that she uses but one handkerchief a day, against the use of four or five, and that there has been marked relief from the headache.

CASE 5.—*Retrobulbar Neuritis, Resulting in Central Scotoma from Suppuration in the Posterior Ethmoidal Cells.*

The extensive involvement of the nasal accessory sinuses confined to one side and the unfortunate result, namely, partial blindness in one eye, and facial deformity, prompts the report of this case in some detail.

C. G., age 46, sought treatment Sept. 12th, '05, in the Ear, Nose and Throat Clinic of the Med. Dept. of the Univ. of Southern California. He had had constant "nasal catarrh" since a boy of 12 or 13 years of age, always from the right side of the nose and accompanied in the beginning by more or less pain in the head and right eye. When about 16 or 17 the trouble "came to a head." The whole right side of the face and head pained severely for many days. He remembered particularly the pain deep in the right eye, which felt as if

the eye was being forced out. The right cheek began to swell and pain as if with the mumps. There was no swelling of or above the eyebrow. The painful swelling of the face was below the eye, but the eyelid puffed out somewhat. After several days of suffering an operation was attempted. He was taken to a Brooklyn hospital and a preliminary operation (tracheotomy) was done, but further operation was abandoned on account of the patient's bad condition. His life was despaired of. The cheek abscess finally broke; marked relief from pain followed; foul-smelling pus escaped for several weeks through the cheek. The fistula finally healed but the cheek bone remains thick, hard and prominent to the present time. The nasal discharge had also persisted, but no more bad symptoms had arisen. He dated and attributed the eye trouble to the abscess inside of the cheek. He remembered that his vision was perfect up to that attack and that he was blind thereafter; that he could not count the fingers of his hand when held before his eye, and that all objects looked hazy. Gradually the eyesight improved somewhat. When he looks directly at an object he cannot distinguish it, but must look a little to one side of it. Also, he remembered that his right eyeball did not move well for a long time after the attack and still is sluggish in its movements.

Examination.—Marked disfigurement of the right side of the face. The malar region of the right side measures transversely 2 cm. more than that of the left. The nasal process of the right superior maxillary bone shares in the thickening. There is a small scar under the lower border of the malar bone, at the site of the fistula; also a scar of the neck from the tracheotomy wound. The alveolar process of the right side shows a prominent ridge from the second bicuspid tooth upward, with the alveolar mucous membrane firmly adherent (he remembers that the abscess also discharged into the mouth in this locality). The right nasal cavity is almost completely blocked up with tough, red polyps covered with crusts and pus. The septum is greatly deflected, almost completely blocking the left side of the nose, which is otherwise apparently normal. Posteriorly, the right choana was fairly well blocked up with a firm red polyp.

On removing several polyps from the right side of the nose, the view of the interior looked as if the septum were entirely

gone, so great is the deflection. The inferior turbinate was seen to be hypertrophied, the upper part of the nose was full of polyps and crusts covered with pus. On removing these the antral wall was seen to be soft and showed several perforations through which pus escaped. The whole of the nasal wall of the right antrum was removed, exposing a large antrum full of polyps and pus. This was easily accomplished without an external operation, due to the septal deflection and the complete absorption of the bony part of the antral wall. In fact, the nasal wall of the antrum consisted of greatly thickened mucous membrane. The antrum was cleaned out and dried. Its walls were covered with thickened muco-periosteum and no necrosed bone could be seen or felt. Later the remains of the middle turbinate and the ethmoid labyrinth were removed.

The bony cell walls had also been absorbed, leaving a grumous mass of hypertrophied mucous membrane, polyps and pus. On cleaning this away, the naso-frontal duct was plainly seen, and a large frontal sinus explored. The frontal sinus was empty and its mucous membrane felt smooth and fairly thin. Posteriorly, above and behind the sphenoid a large irregular cavity presented after removal of several polyps, evidently a large posterior ethmoidal cell. This cavity was somewhat larger than the terminal phalanx of the middle finger, extending backwards to a point 9 cm. from the anterior nasal spine, and overlapped the sphenoid cell. It was lined with thin, pale, muco-periosteum. The sphenoid ostium was seen to be about 1.5 cm. above the upper limit of the posterior choana; a probe passed in about 2 cm. into a small, shallow, empty sphenoidal cavity.

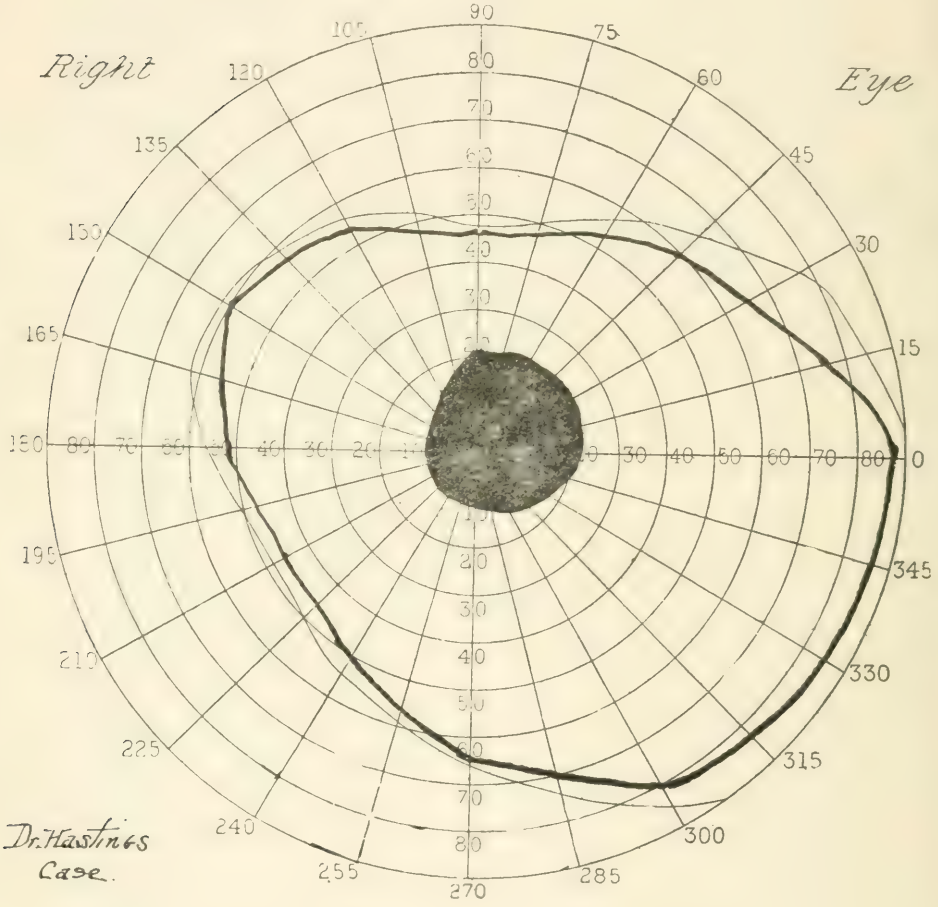
At present, Feb. 1st, '06, the intranasal examination shows that the antrum, large posterior ethmoidal cavity, and the right nasal chamber form one large cavity, into which opens above the naso-frontal duct (6.5 cm. from the anterior nasal spine) and behind the small sphenoidal ostium.

The following measurements of this combined cavity were made by use of graduated probes and are very nearly correct:

(1.) Maxillary Antrum: Height 3 cm., width 3 cm., depth 3 cm. The outer angle of the antrum is 6 cm. from the nasal septum, making an unusually wide nasal cavity.

(2.) Posterior Ethmoid Cell: Height 1.7 cm., width 1.7 cm., depth 2.5 cm. Its posterior wall is 9 cm. from the anterior nasal spine.

(3.) The sphenoid ostium is small, 7.25 cm. from the anterior nasal spine, and a probe can be introduced through it to a depth of 2.25 cm. The cavity seems to be shallow and empty; no pus has been seen coming from it.



It is difficult to say which sinus was the cause of the retrobulbar neuritis. The history of the violent attack of inflammation followed by rupture of the anterior wall of the antrum, apparently through the canine fossa, points to this cavity as

an orbital abscess may have occurred simultaneously. However, the patient states quite positively that the swelling was below the orbit, and that there was no redness or swelling of the eye and no bulging of the eye-ball, all of which would be expected in an orbital abscess of the size indicated by his history. Also, an orbital fistula would have more likely resulted.

The presumptive evidence, therefore, points more strongly to the suppurative inflammation in the ethmoid labyrinth, which must have been most severe. The size and position of the posterior ethmoid cell indicates that in this case it likely enters into the formation of the optic foramen as demonstrated by Onodi. In such cases, Onodi states that the septum between the nerve and the cell is always as "thin as the thinnest paper." Inflammation of the nerve would in this case easily occur during the severely acute attack. In fact, it is difficult to see how the nerve would have escaped being affected.

I am greatly indebted to Dr. W. D. Dilworth, who was interested in the case, for the following report of the eye condition:

Right Eye. Direct central vision, zero. When eye is directed 25 to 30 deg. either above or below, to the right or left, of the type, he has 2-60 vision, which lenses do not improve. External appearance, normal; extrinsic muscles act normally. Reaction of pupil, normal; lens and mediá are clear; fundus normal, except for atrophy of fibers of the temporal segment of the optic disc. Form field, normal. Absolute central scotoma (see chart), extending from 10 deg. nasal to 22 deg. temporal, and from 20 deg. superiorly to 12 deg. inferiorly. Perception for colors is so poor that color field cannot be recorded. Diagnosis: Retrobulbar atrophy.

Left Eye. Normal, except for refractive error. When corrected vision is 6-6.

DISCUSSION.

Dr. Wendell C. Phillips, New York, wished to emphasize that the sphenoidal sinus was most apt to give rise to severe ocular symptoms. Ordinary syringing of the sphenoidal sinus is rarely of permanent benefit, but its anterior wall should be removed, making it impossible for gelatinous masses to reform.

Dr. W. L. Ballenger, Chicago, felt in accord with the pre-

vious speaker because of a point he mentioned in reference to the method of treatment of sphenoidal suppuration. This sinus was often divided by septa, and irrigation on that account was not always successful, and in chronic or severe acute cases, the columnar ciliated epithelium has lost its ciliae, and the epithelium may be broken down. The action of the ciliae is responsible for carrying the secretion up to the ostea. This was true of the sphenoidal, hence, in the chronic cases the drainage of the sphenoidal sinus was imperfect on account of the loss of motion of the ciliae of the columnar epithelium. The expression was also used in the paper that he had curetted the ethmoidal labyrinth. The speaker has made observations upon the cadaver and has found that in some cases the entire labyrinth may be removed by the intranasal route, while in other cases it cannot, the anterior cells being inaccessible. There is also a danger, which does not exist if the external method is chosen. The anterior ethmoidal artery passes through the cribriform plate anteriorly, and it is of considerable size, and is often the source of severe hemorrhage. It would be rather difficult to check the hemorrhage properly, if the intranasal route were chosen, whereas if the side wall of the nose (nasal process of the superior maxilla) were removed, the artery would be easily accessible in case of hemorrhage and the latter could be easily checked.

Dr. M. A. Goldstein, St. Louis, said that in the development of his sinus work and of the work of others, the aid of the ophthalmologist had been given. There were many cases which pointed out rather obscure symptoms of the sinus, and it was a matter of extreme value, both to the ophthalmologists and to the members of this body, that this co-operation was being rapidly brought about.

Dr. Derrick T. Vail, Cincinnati, said that five years ago he had read a paper on optic neuritis resulting from intranasal disease. The intimate connection of the vascular, nervous and lymphatic supply that exists between the orbital and nasal structures, is so great that it is amazing that rhinology has been practiced so long without realizing the practical side of that important matter. In the case where the eye partakes in the semiology of the disease of the nose, the affection is usually monocular and located on the side of the nasal disease. If the posterior ethmoidal and the sphenoidal cells become empyemic, retro-bulbar neuritis is apt to occur, due to

the contiguity of the optic nerve to the sphenoid and ethmoidal sinuses. The optic chiasm lies upon the sphenoidal body and there is only a thin layer of bone between the optic nerve and the sinus on the other side. Since this part of the optic nerve is one and one-fourth inches behind the eyeball, the ophthalmoscopic examination usually reveals nothing; a normal picture is found, or simply a slight congestion of the optic nerve head. It is, therefore, impossible to tell in these cases that there was or is a positive inflammation of the optic nerve. The ophthalmoscope is of little advantage in diagnosticating this condition; the diagnosis must be made by other methods, principally the field of vision; such a test will usually reveal a central scotoma. The fibres of the optic nerve that supply the macula lutea lie at the center of the nerve at the optic foramen. These fibres are vulnerable because they are more highly specialized. Interstitial swelling shuts off the function of these delicate macular fibres and produces a central scotoma. He recently had a patient who had constant pain in his right eye which was so annoying that it became unbearable, but he had no nasal symptoms, and on inspection, Dr. Vail found the middle turbinate body enlarged and pressing against the septum and hanging down, blocking the middle fossa of the nose. He removed the middle turbinate body, and found it the site of polypoid degeneration. The ethmoid cells themselves were full of polypi, and two or three drops of creamy pus were found. A thorough removal of the ethmoidal labyrinth was followed by relief, but how the case will ultimately terminate is impossible at the present time to state.

PAPER.

MIDDLE EAR SUPPURATION AS AN ETIOLOGIC FACTOR IN RETROPHARYNGEAL ABSCESS.

E. M. Holmes, M. D.

The frequency with which suppurative processes in the middle ear extend into the mastoid cells, and occasionally from these into the cranial cavity above and the digastric fossa below, is generally well known. Judging by experience, and a study of the literature, the invasion forward into the pharyngeal structures is exceedingly rare. Indeed, retropharyngeal abscess in the adult from any cause is a rare condition.

The formation of pus with the accompanying changes in the mucous membranes of the mastoid cells, causes pressure upon and a general stasis within the vessels nourishing both the mucous membranes and the bony framework of the whole mastoid area. The only natural drain of the mastoid cells is the aditus, which is situated at the top of the cavities when the head is near the upright or horizontal position, and at the best is small, and offers a poor channel for the discharge of thick pus. The maintenance of a free circulation is an important factor in the prevention of a destructive process, as well as in the repair of an injured tissue. For this reason all suppurative processes are given early surgical treatment.

It is evident that in the structures behind the ear we have favorable conditions for a destructive process whenever there is septic invasion, and the reason why the destructive processes so rarely advance forward, is likely that the Eustachian tube and pocket which lodge the tensor tympani muscle give free drainage, which not only liberates the irritating secretions, but avoids pressure upon the local circulation. We can understand how through adhesions and the formation of granulation and polypoid tissue, or other new growth, the drainage of the anterior portion of the middle ear can be interfered with, or entirely blocked.

If there is a suppurative process under these conditions, the Eustachian tube, if patent, may care for the secretions, and thus extensive disease be avoided. When, however, the tube also becomes obliterated, there is no reason why the suppuration should not advance here, producing necrosis of surrounding tissue, as it does in other localities; and this is probably what does take place in the few cases which advance and form abscess cavities behind and about the pharngeal wall.

Even where there is a blocked Eustachian tube and tissue within the middle ear retarding the drainage of pus, the diseased area is so small that only a small amount of secretion would be likely to form, and that so slowly, that only rarely would it produce much pressure.

While it is evident that we have in the tissue behind the ear most favorable conditions for the advance of a suppurative process, there is only very rarely present the conditions necessary for the advance forward of such a process.

In the second century, Galen referred to a case of retropharyngeal abscess. So far as I can learn, one of the earliest reports of cases was by Abercrombie (1), who in 1819 described three cases as observed in children. In 1850, Fleming (2) reported two cases. Henoch during 1850 and 1851 (3) published a report of cases. The elder Bokai (4) in three different papers reported, in all, 129 cases. They were all observed at the Children's Hospital at Pest between 1854 and 1876. His son (5) took up the work and reported 138 cases of his own. There are a large number of writers who have reported one or more cases, but when we search for reports of retropharyngeal abscess in the adult, we are impressed by the comparatively few cases which have been recorded.

As it is not my purpose to discuss the general subject of retropharyngeal abscess, I shall mention only those cases reported as occurring in the adult, as both cases which I report in this paper were in adults and of aural origin.

In a paper presented by Watson (6) in 1903, he reported one case occurring in an adult. He was able to find only 16 other cases reported. Among these were the cases of Gunther, Heald, Syme, Goodale, Bosworth, McCoy, Moore, Lennox-Browne, Fischer, Dunn and Shirley. Besides these I have been able to find the case of a man 46 years of age

reported by Levestine (7), one of an adult by Petrunti, one by Downie (8), of a woman 79 years of age, one by Cheyne (9) in an adult 42 years of age, one by De Blois (10) of a man 27 years of age, one by Berg (11) in an adult, supposed to of tubercular origin, and one by Allen (12) in a man 38 years of age. Lennox-Brown says that in his clinics he sees twice as many cases in adults as children, but he gives no statistics.

Both Bokai, senior and junior, mention the ear when speaking of etiology, but they included no such cases in their statistics, nor did they report the aural conditions existing in their reported cases. Huber (14), in reporting cases, mentions one which ruptured into, and discharged from, the external ear.

Oppenheimer (15) in his paper upon the etiology of retropharyngeal abscess, speaks of the possibility of the retropharyngeal glands becoming infected from a suppurative process in the middle ear.

Klug (16) reported a case of aural origin, with erosion of the carotid artery. Urbano Melzi reported a case of a child 2 years of age, who had a retropharyngeal abscess which he considered of aural origin.

Weil (17) states that suppuration of the tympanic cavity in children is not an infrequent cause of retropharyngeal abscess. He also reports a case of a child who died, where the post-mortem showed extension from ear into retropharyngeal abscess.

In reply to 250 cards of inquiry, addressed to ear, nose and throat surgeons, 147 reported as never having seen a case of retropharyngeal abscess due to middle ear suppuration, ten reported as having seen one or more cases.

Hoping that the discussion of this paper will be taken up by many of the gentlemen who have so kindly submitted their reports, and that then we can find there are sufficient facts to prove beyond reasonable doubt that all belong in these statistics, I submit them as they were presented to me.

Dr. Chevalier Jackson reported as follows: "My notes on retropharyngeal abscess are imperfect, but as I have thought for many years that the frequency of otitis media as the primary pus focus is overlooked, I have rather full notes of twelve cases associated with (and probably secondary to) purulent otitis media. In six of the cases, ear trouble

had not been noticed until I searched for it; in four cases it had been noticed, but was not considered of consequence; in only two was its true etiologic significance recognized. In four of the six unrecognized cases, no discharge was escaping from the canal, the drum membrane being healed or unperforated. In three of the cases, the otitis media might be called chronic; nine were acute. The primary diseases which preceded the otitis were: scarlatina, four; measles, two, diphtheria, two; influenza, two; rhinitis, one; unknown, one. Three showed evidence of hereditary syphilis.

The pus organisms found in the pus of the abscesses were:

Streptococcus, pure	4
Staphylococcus, "	1
Streptococcus and Staphylococcus, mixed	2
Pneumococcus	1
Not examined	4

(Approximately)

Ages: Two years.
Three "
Four "
Two "
Two "
One year.
Ten months,
Fifteen "
Six "
Two "
Two "
Fourteen "

Average about eighteen months.

Sex: Eight were females, four males.

One abscess burst spontaneously before my arrival; one burst during digital examination; one asphyxiated the patient before my arrival; nine were incised. Two were tracheotomized, one for a complicating perichondritis, and one because breathing had stopped during digital examination. Both of these cases recovered. Of the twelve cases, two died, one of asphyxia before my arrival and one of sepsis."

Dr. A. E. Crockett has seen five cases, one of which was reported a year ago in a paper on "Thrombosis of Sinus and Jugular."

Dr. Robert E. Moss has seen three cases, two males, 40 and 65 years of age; one female, 26 years. Both men had mastoid operations.

Dr. F. B. Sprague saw a woman, 30 years of age, in Politzer's clinic, who had retropharyngeal abscess due to ear extension. He is also treating a man, 30 years old, for the same condition.

Dr. J. J. Thomas operated on a girl 7 years of age, in whom a middle ear suppuration had extended into nasopharynx. Perfect recovery after incision.

Dr. S. H. Lutz reports case of female, 2 years old. He incised abscess and child left hospital in five or six days.

Dr. D. C. Green, Jr., operated on girl, 3½ years old, for retropharyngeal abscess, which was undoubtedly due to middle ear inflammation.

Dr. E. W. Day saw a man, 18 years of age, who had had middle ear suppuration since childhood. Patient was in dying condition when first seen, and as there seemed to be obstruction to breathing, a digital examination of throat was made, and a large retropharyngeal abscess found. Opened with finger. Patient died, although no pus entered larynx.

Dr. J. A. Stucky has seen a 3-year-old girl who had retropharyngeal abscess due to an acute middle ear suppuration. Opened with finger. Child made perfect recovery.

Dr. Thomas Hubbard reports the following case: A man, 55 years of age. O. M. P. A. Neglected. Mastoid suppuration. Bezold perforation. Pus burrowed toward pharynx and discharged spontaneously. No operation other than incison over mastoid allowed. Patient died from exhaustion and general septicemia.

In making a diagnosis, we have the same conditions to differentiate as with retropharyngeal abscess from any other cause. Perhaps the most important thing to eliminate is aneurism. Fortunately, that condition is very rare, comes on slowly, without the septic symptoms, and usually shows more swelling and bulging of tonsil and soft palate. The pillars of the pharynx are usually carried forward and inward to a more marked degree than in retropharyngeal abscess.

A marked, deep, cervical cellulitis, a new growth, or an

injected and swollen gland might be mistaken for a collection of pus. In these conditions we would get no fluctuation.

Whenever we find a retropharyngeal abscess with the history of a chronic discharging ear on the same side, we should at least consider the ear condition as a possible etiologic factor. If possible, a probe should be passed, and the anterior portion of the middle ear explored. In the second case I report, the probe not only detected bare bone but was pressed forward into a cavity, and upon removal considerable pus escaped.

Although we are all familiar with the general anatomy of the pharynx, of the anterior wall of the middle ear, and of the superficial relations of the triangles in the neck, there may be some doubt of the relations between these areas. I found when operating upon the first case, that I was not quite sure about how many important structures might be located between these areas. The large vessels could be distinctly felt by the finger, but the nerves could not be thus located, and I was afraid I might wound or destroy one or more of these.

In reviewing the anatomy of this area I will, for convenience, begin with the pharyngeal wall, a region with which we are all familiar. Here just below the mucous membrane are the three pharyngeal constrictors, with their aponeuroses forming the walls of the pharyngeal tube. These muscles are so arranged that the superior is overlapped by the middle, and the middle by the inferior. This muscular tube is attached above to the pharyngeal spine of the basilar process of the occipital bone, the posterior portion of the mylohyoid ridge of the inferior maxilla, the side of the base of the tongue, the pterygomaxillary ligament, the lower third of the posterior border of the internal pterygoid plate, and the hamular process of that plate. Below it is attached to the posterior part of the side of the cricoid cartilage behind the cricothyroid muscle, to the inferior cornu, the oblique line and the superior border of the alae of the thyroid cartilage. It also attaches to the stylohyoid ligament, the little horn and the whole upper surface of the great horn of the hyoid bone. Directly behind this muscular tube are the anterior vertebral muscles and the lymphatic glands, but at either side is an area somewhat prismatic in shape which is of much interest to

our present study. Above is the lower surface of the posterior portion of the temporal bone, the fibrous floor of the Eustachian tube and a small posterior portion of the great wing of the sphenoid bone. Through this bony superior boundary pass the internal carotid artery, the internal jugular vein, the middle meningeal artery and the pneumogastric, glossopharyngeal, hypoglossal and inferior maxillary nerves. The anterior and outer boundary is made by the ramus of the inferior maxilla and the outer pterygoid plate. Posteriorly, the bony landmark is the styloid process of the temporal bone. There is no fixed lower boundary to this space, and pus can dissect as far as and into the mediastinum. The internal pterygoid muscle occupies much of the anteroexternal space. Between this muscle and the ramus of the inferior maxilla are the internal maxillary artery and the dental nerves and vessels. There is considerable cellular tissue between the anterior portion of this muscle and the superior constrictor of the pharynx. This cellular tissue offers less resistance to dissecting pus, and here we would expect to find its first appearance when coming from the anterior portion of the tympanum.

A cross section at about the level of the tip of the mastoid shows the following relations: Near the median line the pharyngeal muscles are in contact with the prevertebral muscles. Only a few lymphatics are between them. We find that the pharyngeal tube curves forward, and at either side is an area, somewhat triangular in shape when thus viewed, in which are situated the following structures:

Posteriorly is the internal jugular vein, just at the inside of this is the pneumogastric nerve, slightly anteriorly and internally is the internal carotid artery. These are surrounded by firm fibrous tissue. To the outside and just in front of the internal jugular vein is the tip of the styloid process, and the beginning of the styloglossus, stylopharyngeus and stylohyoid muscles. In front of this is usually found a portion of the parotid gland, which dips deeply into the neck at this area. A short distance in front and to outside of the internal carotid artery is the external carotid artery. In this locality are also situated the hypoglossal and glossopharyngeal nerves. Between these structures and the pharyngeal muscles are an area of loose connective tissue, in which are a number of veins. At the level of the vault of the pharynx, which

is also the level of the bony wall of the Eustachian tube and that of the bone liable to be attacked in extension of middle ear disease, we also find situated, just in front and to outside of this triangular space, the inferior maxillary division of the fifth nerve, the middle and small meningeal arteries, the auriculotemporal nerve and its two roots about the meningeal artery and some of the branches of the internal maxillary artery. It is important to remember the relation of the pneumogastric, the glossopharyngeal and the hypoglossal nerves.

The pneumogastric nerve is to outside of the internal carotid artery and between this and the internal jugular vein. It is in a common sheath with these vessels, and is not liable to injury. The glossopharyngeal nerve leaves the cranial cavity through the jugular foramen. It passes obliquely downward and forward, between the internal jugular vein and the carotid artery; crossing the latter obliquely it passes about the muscles attached to the styloid process, and from here lies upon the middle constrictor of the pharynx, just below the lower border of the body of the inferior maxilla.

The hypoglossal nerve leaves the cranium through the anterior condyloid foramen and descends nearly vertically toward the angle of the jaw. It is internal to the carotid artery and internal jugular vein. It passes forward and between these, and finally about the posterior belly of the digastric muscle. It passes around the occipital artery, and over the external carotid and facial arteries. Near the great horn of the hyoid bone, it crosses over the superior laryngeal nerve.

The bone liable to be involved in a necrotic extension from the middle ear is just in front and to outside of the great vessels as they pass through the base of the skull, and just in back of the meningeal artery and inferior maxillary nerve. The distance between these structures is only about half an inch. In exploring this area, the finger is carried through the pharyngeal opening, and then directed outward, pointing toward the external auditory canal. The large vessels can be felt just in back and to inside, and are a good guide to the region we wish to inspect.

When there is a formation of retropharyngeal abscess from a previous suppurative process in the ear, the chances are that we have not only soft necrotic tissue but also diseased and broken-down bone. This necrotic bone demands the attention

of the operator, for unless it can be removed the chances are that there will not be satisfactory results following the operation, any more than there are when such conditions are not eliminated during the mastoid or any other operation where bony structures are involved.

We find a diversity of opinion among good operators as to the best methods of reaching and treating retropharyngeal abscess. Burkhardt (17) of Stuttgart in 1888 described a method for external operation, and he strongly advocated his method in a very excellent paper. He advised an incision in front of the sterno-cleido-mastoid muscle, and at level of the larynx. The thyroid vessels are carried backward, and the larynx forward, and the incision carried into the deep retropharyngeal area. In this locality the carotid gives off no branches, and the incision is below the hypoglossal and glossopharyngeal nerves.

Chiene of Edinburgh (18) advocates making an incision from the mastoid proceess downward, just back of the sterno-cleido muscle. Then by direct dissection reach the styloid process, with the muscles and ligament-like fascia; from this the dissection is carried inward and upward into the retropharyngeal space. Those who advocate the external routes are apparently, about equally divided as to the choice of these two methods. The advantage claimed for the external operation is that a thoroughly aseptic operation can be performed only in this manner, that diseased tissue can be removed without haste and without danger of materials entering the larynx. This may be true when dealing with broken-down glands (tubercular), but when the infection has come from the ear, the chances are that the same pyogenic organisms are present in the abscess which are present in the ear and pharynx. In this case the pharyngeal wound can care for and resist infection as well as if not better than the tissues about the incision in the neck.

Unless there has been extension into the cervical structures, the majority of the operators are inclined to open these abscesses through the pharyngeal wall. Although I made a free opening through pharyngeal wall, and through the ear, and obtained a profuse discharge from both, it was necessary to perform a secondary operation upon one case, and that from the outside, as the pus continued to dissect downward and outward. The diseased bone is at such depth that it is prac-

tically possible to explore it only by the sense of touch, and the usual external openings offer no better opportunity than the pharyngeal incision.

This area of disease in the petrous bone is at the level of the condyle of the jaw. The space between the ramus of the jaw and the mastoid process is very narrow at the best. The styloid process with the attached muscle is in this space, and obscures the area of the disease. The only way in which direct inspection of this area can be obtained, and still save the articulation of the inferior maxilla, is by incising the ramus, and then rotating the upper portion upward, outward and backward. Even by this procedure, we have to sever a portion of the masseter and internal pterygoid muscles. The hemorrhage is hard to control, and the resulting deformity is likely to be marked. The parotid gland would be liable to be injured, and there would be considerable loss of power of mastication.

Were it not for preserving the articulation of the maxilla, the ideal method would be to remove the condyle of the maxilla, and the anterior wall of the external auditory canal. By this procedure the important vessels and nerves could be avoided, and if a given case refused to heal after the other means had been tried and should there be signs of necrotic bone, this operation might become necessary.

There is still another avenue of attack, and that is through the cranial cavity, and of course would only be resorted to in case there were unmistakable signs of cerebral invasion of the suppurative process. A trephine could be made just above and in front of the external auditory canal where by elevating the dura the anterior portion of the petrous portion of the temporal bone could be exposed and explored, and any diseased portion removed.

The first case of retropharyngeal abscess due to extension from the middle ear which came under my care was Mary McD., age 14, who was admitted to the Boston City Hospital, June 21, 1900. She gave a good family history, with the exception of having lost one brother with pulmonary tuberculosis. Her personal history was comparatively free from disease, having had measles at 4 years. The only other trouble was a discharge from left ear. This began when she was a small child. The discharge had varied much in character and amount, but there had been no particular annoyance, ex-

cept from the disagreeable odor. This had been at various times separated by long intervals of comparative freedom from symptoms. Present history: Four days ago, began with a severe pain in and about left ear, extending into throat and lasting for twenty-four hours. Later, pain was worse in left side of face. Three days ago, throat began to swell, and neck was swollen on outside. For two days has been very hard to swallow, and breathing has been rather difficult. Has been worse to-day, and therefore came to hospital. The patient was a fairly large and well-nourished girl, but presented the appearance of marked sepsis. The temperature was 103°, the pulse 120. The left side of face was swollen, especially at angle of jaw and below ear. The sterno-cleido muscle was tense. The deep cervical glands on left side were much enlarged. Both pupils were normal. Lungs and heart were normal. Left auditory canal was much swollen, and there was very foul-smelling pus in canal. There was much granulation tissue in the middle ear, and it was impossible to see the general landmarks. A fine aural probe detected areas of bare bone. I tried to direct probe into the Eustachian tube, but was not successful, as the anterior portion of the tympanum seemed filled with soft polypoid tissue.

Examination of throat showed a marked swelling of the posterior pharyngeal wall, mostly on the left side, the lateral wall was pushed forward, carrying the left tonsil with the pillars forward. Had it not been for the pharyngeal swelling, it would have been very easy to mistake the condition for a peritonsillar abscess. The mucous membrane of the right side of pharynx was of a dark red color and swollen, but that covering the pronounced swelling was dark (bluish) red, almost a black, more like that covering the base of tongue when there is a marked varicose condition of the lingual veins. I was much impressed by this dark color, as was Dr. Taylor, the house surgeon. Before I examined the case he told me that the throat was black in color. This dark color was probably due to a venous stasis caused by pressure on the veins relieving this area. There was a wound in the palate which Dr. Taylor had made in the belief that he would reach pus, as he was of the opinion that we had a peritonsillar abscess which had extended backward.

Palpation showed a tense, non-pulsating but fluctuating mass

on the left posterior pharyngeal wall, which extended at least as low as the upper rim of the glottis. It took up the whole lateral wall of the pharynx, pushing the left tonsil far forward. The tonsil, however, showed very little if any swelling.

I advised an immediate operation for both opening the pharyngeal abscess and removing the granulation tissue in the middle ear. I did not propose performing a thorough exenteration upon the ear, as I felt the gravest condition was the large collection of pus in the throat, and as the patient's condition was rather poor, the pulse being weak, and the general appearance being that of profound sepsis.

The ear was cleaned with a sterile solution, followed by one of mild corrosive sublimate. Fearing that a tracheotomy might be necessary, the neck was cleansed and a corrosive pad applied. The patient took ether without trouble, and was placed in a semi-Trendlenberg position, with the head held to the left side. The tongue was caught by a tenaculum forceps and carried forward out of the mouth, which was opened as far as possible, and this was sufficient to give fairly good space for operating. To avoid a too sudden escape of pus, I made an incision about 1-3 of an inch in length above and to the left of the median line. Fully three ounces of a rather dark colored, foul smelling pus was immediate evacuated. The odor was similar to that found in a gangrenous appendix. The incision was now enlarged by inserting blunt scissors and then spreading the blades. In this manner an opening sufficient to admit the finger was obtained. I could not reach the bottom of the cavity, but could distinctly feel the great vessels, and, while carrying the finger upward and backward, it came in contact with rough bare bone. I now passed a probe beside the finger and demonstrated its contact with bone to those assisting in the operation. A very fine probe was used, and while moving it carefully over this area it entered a sinus and through this into the middle ear. I now passed a probe into the external auditory canal, and was able to make contact with the one which was passed from the throat. With a ring curette, as much of the soft granulation tissue was removed from the middle ear as possible, and with the index finger of the left hand in contact with the exposed and necrotic bone in the abscess cavity, I gently removed with the small middle ear curette with a curved shank,

a little at a time, the brittle bone, until the curette could be felt with the finger. This was carried as far as I dared, and until the bone was apparently much less brittle. A large abdominal probe was then passed through the throat and out of the ear. It was a question whether to make an external incision so that the deeper portion of the abscess cavity could be inspected and more thoroughly cleansed, or to trust to the drainage already made. The pulse was 130 and not of too good tension, and as much time had already been taken in the operation it seemed best to cleanse the cavity of debris and await developments. The cavity was thoroughly cleansed with sterile water, and a drainage tube passed through auditory canal into the abscess cavity. The pharyngeal opening was packed with iodoform gauze. June 23, the following day, the patient had made a good recovery from ether, the pulse was 96, the temperature fluctuated between 100° and 104°, as shown by accompanying chart. There was profuse discharge through the tube, and also into throat. The packing was removed from the throat, the wound thoroughly cleansed and a fresh iodoform packing inserted. The throat was sprayed every two hours with antipyrin and Dobell's solution.

On June 24, the second day after the operation, the cellulitis of neck had extended over left side of face. The left eye was nearly closed. The lower neck had become swollen, the whole resembling somewhat that of erysipelas. At angle of the jaw and below the ear was a swelling which showed fluctuation. Pressure on this did not force pus through channels already made. It seemed advisable to give vent to this collection of pus, and another operation was advised. The patient was again etherized, and an incision made just in front of the sterno-cleido mastoid. After retracting the skin the fascia was found to be tense, and as soon as this was severed pus of the same character as that found in the other abscess was evacuated. This pus had dissected into the area of the superior cervical triangle. This cavity was about the size of a dove's egg, and a probe, with which I was exploring the walls, passed into the abscess cavity above, and was passed into the throat through the pharyngeal opening. The cavity was cleansed with a dull curette and packed with gauze, and a perforated rubber tube inserted. June 25, the day following the conditions were apparently improved, patient felt much

more comfortable, had called for food and had swallowed three egg-nogs. The nutrient enemata which she held very poorly were stopped. There was much pus coming from the tube in ear, and also passing through the pharyngeal tube into throat. There was almost none escaping from the cervical wound. Twenty-four hours later, as there was so little discharge from the cervical wound, the gauze was removed. The swelling of face and lower cervical area was very much less, and the general conditions were much improved. The patient was losing the marked septic appearance. By June 28, the cellulitis of the face was nearly gone. There was only slight discharge from the cervical wound, and the discharge from ear, though considerable, was less than at first. The patient was taking considerable liquid, and was gaining much in strength.

There was nothing of importance to note again until July 2, when the tube was removed from the external opening. The pharyngeal opening was becoming small, but considerable pus was removed each day when the cavity was cleansed. There was considerable granulation tissue in middle ear which was removed by curette.

July 9. The pharyngeal wound was entirely closed; the discharge from ear being thick, a solution containing papain and .2 of 1% of HCl was given to use three times a day.

July 21. There has been constant improvement, the discharge has steadily become less and much thinner; at present it is more like serum in appearance. The patient is discharged from the hospital to report at the out patient department for treatment.

She was treated at the O. P. D. for a few days, and then, feeling so well, stopped coming. I saw patient again in January, 1902, when she visited the Boston Dispensary, to learn if anything could be done to improve her hearing. The middle ear was perfectly dry, and had the whitish appearance of epidermis. A probe could not enter the Eustachian tube. The hearing was poor; could hear watch on contact, Politzer's acumeter about three inches. The 5C forks were:

R	*a*	38	43	48	37	7	24′	Whisper
	b			14				
		C	Ci	Cii	Ciii	Civ		
L	*a*	0	0	5	8	6		
	b			17			3″	

On November 8, 1900, Dr. McDonald of Brookline, who was taking a clinical course with me at the Boston City Hospital when I operated upon the case just reported, brought a patient, Miss Annie W., to the St. Elizabeth's Hospital for examination of her throat. She was 26 years old and had always been well, except for a suppuration in the right ear, which she had been annoyed by, off and on, since a baby. Her father and mother were both alive and in good health. Three brothers and four sisters had always been in good health. She had had attacks of pain in the right side of throat at various times for the past three years. Several physicians, both in and out of hospitals, had examined the throat, and told her there was nothing in the throat to be found, and the pain was probably reflected from the ear, or from some tooth. A spur had been removed from the right side of nose at the Boston Dispensary two years before, in hope that this was the cause of the pain located in the throat. About October 23, she had another attack of the same pain, located in the right side of the throat. There were several attacks of chilliness but no rigor, followed by what she called fever turns. She consulted a physician, who advised her to have a tooth extracted. This was the right inferior twelve-year molar, which had been cariosed for some time. Two days later she had the tooth removed, but was not relieved for four days. Following this there was a cessation of pain for three days, when it began to be more severe than at any other time. There was a distinct chill, and marked weakness. Dr. McDonald was called to see patient and found her with a pulse of 94, and a temperature of 101.8°. This was in the morning of November 2. Examination showed nothing in the throat. The right ear was filled with foul thick pus, and, after syringing, the internal wall was found to be covered with granulation tissue. There was tenderness in front of ear and back of angle of jaw. This he thought due to inflammation in the ear, and ordered hot sterile douches every hour. At 8 o'clock in the evening, the temperature was 103.4° and patient appeared much worse, but Dr. McDonald said he could find no signs of trouble in the throat. He prescribed calomel followed by salts, and applied heat in form of poultices in front of the ear. Following day, the temperature was lower, and the pain and other symptoms seemed relieved. The treatment of ear was continued. There

was apparent improvement for two days, when there was another exacerbation. During this attack, no new symptoms or signs presented, and in 48 hours there was considerable improvement. On the morning of November 8, there began to be more pain, and the patient was brought to the hospital, where I saw her at about 11 o'clock in the morning. She had a temperature of 100.8°. There was no external swelling visible, but pressure into space between angle of jaw and the mastoid process caused pain, and there was induration which we could both distinguish. When the mouth was opened there was more pain, yet it was opened without much apparent effort. Both tonsils were rather large and follicular. The whole pharynx was of a darker red color than normal, but I could see no apparent swelling. When the finger was used there was a distinct difference in the two sides, the right was much more tense, but there was nothing to suggest fluctuation, and had I not seen the other case so recently I would not have given much thought to the idea of a retropharyngeal abscess. The right ear showed considerable swelling of external canal, and a firm polypoid mass was in the anterior portion of the tympanum. A probe came in contact with bare bone in the attic, yet I could not carry it anteriorly about the granulation mass. I advised an exenteration under ether, as the ear had been suppurative for years and as the hearing was nil. The patient would not consent to this, but was willing to stand some pain if I could use cocain and curette the soft granulation mass away. Therefore, after cleansing the ear, a cocain and anilin oil solution was dropped in and allowed to remain for ten minutes. I was able to remove quite an amount of this granulation tissue about the opening of the Eustachian tube, but I could not pass probe into tube, yet considerable pus followed its withdrawal. The curette was again brought into use, and more granulations removed. Suddenly there was a flow of about a drachm of pus. As the pain was considerable and the patient somewhat faint, no more was done. The ear was cleansed and a wick inserted. The patient was taken home in a carriage. Following the operation, the patient got marked relief for six days, when in the evening of November 14 there was a distinct rigor, followed by pain in the back and limbs. The throat again began to be very sore. Dr. McDonald cleansed ear and used probe, hoping to give

relief, but got no amount of pus. The following morning there was visible swelling of the right side of pharyngeal wall. The patient, fearing that another operation would be advised, and doubtless hoping to save expense, did not wish me to be called to the house. During the next night, however, the swelling advanced very rapidly, there began to be some obstruction to respiration and there was much alarm. I was called on the following morning, November 16, and found that we had a swelling of the pharyngeal wall, much more marked on the right side. The swelling was very marked above, the pharyngeal wall being in contact with the soft palate. The patient was now glad to submit to an anesthetic, but made me promise to make no external incision unless forced to do so. The breathing was much obstructed, and preparations were made to perform a hasty tracheotomy, if necessary. After beginning ether administration I placed a McKenzie forceps back of the epiglottis and then separated blades. This pressed the abscess wall backward sufficiently for a freer respiration. The operating table was a kitchen table, so the patient was placed in a Rose position and the head turned to the right. The tongue was drawn forward by a suture passed through it. I first made a small incision through the pharyngeal wall, a little above the palatal arch, having first lifted the palate with an elevator. A large amount of pus was evacuated, and after having pressed out all possible, the incision was enlarged by scissors. The forefinger, passed through the opening, was carried outward and backward and came in contact with bone. A probe now passed into the ear was easily carried through, and into contact with the exploring finger. As in the first case, I removed considerable bone with the small aural curette, and passed a small perforated tube from the ear into the abscess cavity. As the pharyngeal opening was made high up, I did not pack this with gauze, but left it open. The patient recovered from ether and showed marked improvement immediately. There was a profuse discharge from the ear for the first forty-eight hours. The cavity was cleansed by douching through the ear with a boracic acid solution three times a day, and the solution entered the throat every time.

November 18. Temperature was only one degree high, patient seemed better in every way, and was practically free from pain. The pus began to be less in amount and much thinner.

I did not see the patient again until November 22, for there had been only favorable reports from Dr. McDonald. At this visit, I found the pharyngeal opening closed, and apparently no swelling. There was some soreness upon pressure by the exploring finger. There was only a moderate amount of pus, and we removed the drainage tube from the ear. Orders were given to douche the ear every two hours during the day with warm boracic acid solution. One week later patient came to my office and I was unable to pass a probe anteriorly more than one-fourth of an inch beyond the middle ear. I tried to pass cotton-tipped bougie from pharynx through Eustachian tube, but could carry it only about one-third of an inch into the tube. This led me to believe the tube was occluded. This I found to be the case about a month later. I gave patent a solution of boracic acid and alcohol with calomel to use in ear three times a day. The secretion gradually subsided and was simply of a serous nature at the end of six weeks. I did not see patient again for seven months, when the ear was dry. I could make out none of the ossicles. The hearing was practically nil to air, but patient informed me that she had not heard with that ear for several years. I could not pass bougie nor air through the Eustachian tube.

In the first case, Miss McD. had had a suppurating ear for years before she had the retropharyngeal abscess, and there was a necrotic process extending from the ear to the abscess cavity. Although when I first saw her the abscess was thoroughly developed and I cannot prove that the abscess was not prior to the ear condition, yet with the clear history and the marked necrotic condition of the bone in the anterior portion of the middle ear, together with the advanced condition of the granulation tissues, I am positive that we had an extension from the middle ear.

The second case, developing as it did while under our care, presented no doubt as to the etiology. At the time I met with these cases, I was not aware of the extreme rarity of the condition and was in hopes to meet with more of a like condition. Over five years have elapsed since seeing the last, and I have not seen a retropharyngeal abscess in an adult since. Although, judging by the experience of others, it is doubtful if I see another case in my life, these cases do sometimes occur, and others will see them. For this pur-

pose, I hope this paper may be of value, and also by directing our attention to the possibility of an aural disease extending into and producing a pharyngeal abscess, lead other observers to record the condition of the ears in all these cases. I have been surprised to find that in the reports of so many cases of retropharyngeal abscesses in children, there is so little said in regard to the ears. According to general statistics many of the children reported must have had some co-existing aural disease.

In treating a subject concerning which I have been able to find so little in the literature, and with the personal experience of but two cases, I realize how little I have from which to form conclusions, and such as I present are intended to stimulate discussion and add new interest to the future study of this subject.

In conclusion, I feel justified in stating, 1st, that retropharngeal abscess in the adult from any cause is a very rare condition; 2nd, that middle ear disease rarely advances forward; 3rd, that when this has occurred, there should be a thorough removal of the granular and necrotic material in the ear, and a free incision through the pharyngeal wall, after which the index finger should be placed in the cavity and act as a guide in using the small aural curette passed through the ear, so as to remove as much of the necrotic bone as possible; 4th, that in the two cases just reported, this proceeding with external opening in the first was followed by permanent relief; 5th, that the external routes of attack are available, and perhaps necessary in some cases; but all of these, with the exception of removing the condyle of the jaw, offer very little if any better opportunity to inspect or attack the bone which is diseased in this particular condition.

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DISCUSSION.

Dr. Charles W. Richardson, Washington, said that his experience with retro-pharyngeal abscesses was about the same as most others. He had seen no case where the abscess had had its origin in any ear condition; that condition was rare. He wished to add another case of retro-pharyngeal abscess in the adult, in a negro girl, which he used for demonstration on account of the clearly defined outlines. It was opened and the girl made a good recovery.

Dr. E. B. Dench, New York, reported a case of a girl of 14 who was operated upon for chronic middle ear suppuration. After the operation there was a rise in temperature and evidently some septic infection; but nothing was visible in the throat, with the exception, perhaps, of a slight congestion of the corresponding side of the pharynx. She was immediately etherized, and the grafts were dissected out of the auditory canal, and a tube passed to the Gasserian fissure. It was packed, but the case died on the table, due to a cerebellar abscess which had not been diagnosed.

Dr. Frank E. Miller, New York, said that it was a surprise to him to hear that middle ear suppuration was an etiologic factor in retro-pharyngeal abscess. As Dr. Holmes' paper had been so skillfully and correctly worked up, he had but little to say about such a factor producing this condition. However, he had seen two severe cases of retro-pharyngeal abscess in infants that were not only quite remarkable for their huge size and extension, but for the absolute danger to life from rupture, either intentional or spontaneous. In both cases there was no sign of anything abnormal in the ears throughout the entire conduct of the case. Both cases seemed to follow as sequelae of la grippe, and both had adenoids and tonsils removed at a subsequent period. The first infant was about two months old and was brought to the Vanderbilt Clinic with the sides of the neck swollen flush with the cheeks,

rapid pulse, breathing stertorous, rapid and difficult. With much patience he was able to catch a glimpse of a swelling back of the base of the tongue; on a level and below both tonsils, which were also swollen and red but had no membrane upon them. It could best be felt by the forefinger and seemed a soft mass about the size of a horse-chestnut. Into this an aspirator was inserted and pus removed. The tissues were so soft that a pair of scissors inserted brought out much pus. This was quickly followed by a most depressing collapse, during which the child almost died from suffocation and exhaustion. After about ten minutes the infant seemed much better, and he then found that in addition to the tumor that had been evacuated, a hard mass still remained on the right side near the tonsil; subsequently, the child was again brought to the speaker with a very large external swelling at the angle of the right jaw. On opening this externally, the infant was quickly relieved, and so great had been the distension and penetration of the pent-up pus, that a probe could be carried through the external opening into the mouth where the swollen tonsil was felt at the first visit. The second case occurred one month ago, in a child of three years, with symptoms nowhere near so severe. Realizing, however, the severity of the first child's collapse, he was dispatched at once to the service of Dr. Frank Hartley, of the New York Hospital.

Dr. J. F. Barnhill, Indianapolis, did not understand the reader of the paper clearly as to whether this infection had traveled through the middle ear outside of or through the Eustachian tube. Judging from the symptoms mentioned in one of the cases, some operators who are enthusiastic about ligating the jugular vein, might have done so here without discovering what the disease really was. It seemed to him that the evidence of thrombosis described by the essayist was sufficient for a conclusion that the jugular was diseased and that it should be ligated.

Dr. H. W. Loeb, St. Louis, reported two cases of retropharyngeal abscess. In one case the abscess was evacuated through the pharynx and continued to discharge some little time and then ceased. There was in this case involvement of the cervical vertebra. An orthopedic surgeon put on a plaster cast, and the patient apparently recovered. This occurred four or five years ago, and there has since been no recurrence.

He has seen a few cases of retro-pharyngeal abscess in children, and in not one of them has his attention been called to the ears as a possible source. He thought this point valuable.

Dr. Holmes, in closing the discussion, said, in answering Dr. Barnhill's question, the first case was seen so late that it would have been impossible to eliminate the mastoid absolutely as the exciting focus, yet it would have been unusual to have it heal without having a mastoid operation, although he admitted the abscess was far down the neck. In the second case he did not think there was a question, because the woman made a good recovery without operation on the mastoid. This operation had been refused in both cases. There were cultures made from the pus, but there was practically no tuberculous history. A bronchitis was present in the first case. She was certainly a healthy looking specimen when she was seen two years later at sixteen years of age.

PAPER:

INFECTIVE SIGMOID SINUS THROMBOSIS — RESECTION OF INTERNAL JUGULAR—REPORT OF CASE—RECOVERY.

H. Bert. Ellis, M. D.,

The free communication between the pneumatic spaces covering the lateral sinus and the sinus itself, by the mastoid veins, renders an involvement of the lateral sinus very likely whenever a suppurative process exists in the mastoid; but, as a matter of fact, another very common source of infection is suppuration of the middle ear, the infection reaching the sigmoid sinus by way of the superior petrosal sinus or small venous tributaries, without necessarily a septic process existing in the mastoid.

In brief, infective sigmoid sinus thromboses are ordinarily of otitic origin, and may or may not be secondary to mastoid involvement, however it is through the mastoid we must attack these conditions; not infrequently septic foci are found in the mastoid, though apparently not connected as cause and effect, at the same time as the septic thrombosis.

Infective sigmoid thrombosis occurs more commonly in adults, in males, on the right side and is decidedly more frequent than brain abscess. When an infecting deposit invades the inner lining of a sinus, a fibrous clot forms which may finally occlude the lumen, and pyogenic bacteria develop in the clot, which leads to a general septic infection. The clot may remain localized or extend on down into the internal jugular vein and on to the heart, or pieces of the clot may break off and be carried to other portions of the body and become foci of infection.

The symptoms of this infection are insidious and may not be discovered for some time after the initial involvement.

1. The characteristic symptom, which is most likely first to be noted and possibly the only one, is a sudden rise of the temperature followed by as spontaneous and as sudden a drop

of the same to the normal or nearly normal condition; therefore, the temperature should be taken frequently in acute suppuration of the middle ear whether or not there be mastoid involvement. If there be a meningitis or brain abscess besides the sinus thrombosis, this symptom is somewhat disguised, as the temperature seldom drops lower than 101° to 100°. An uncomplicated sinus thrombosis temperature wave frequently amounts to 6° to 8°, and is probably due to the periodic passage into the circulation of broken down portions of the septic clot within the sinus, causing a general infection. If this condition continues for some time a general sepsis develops, with emaciation and an ashy-hued skin.

2. A severe chill is a frequent symptom, but is often entirely absent. Its existence makes the diagnosis the more easy, but its absence in no way excludes sinus thrombosis.

3. Profuse sweating nearly always follows the sudden rise of temperature, but even this may be absent.

4. Headache, mental dullness, paralysis or convulsion when occurring with the other symptoms of sinus thrombosis leads one to suspect and look for a meningitis or brain abscess.

5. A sinus thrombosis which has existed for some time is likely to extend downward into the internal jugular vein. When this does occur there is likely to be some tenderness along the sterno-cleido-mastoid muscle, but personally I have never felt the cord-like ridge which many authors speak of as occurring in this condition.

6. Swelling of the lymphatics behind the ramus of the jaw sometimes takes place in sinus thrombosis, but is of but little diagnostic value, as it may arise from middle or external ear trouble without any involvement of the sinus.

7. The fundus of the eye should always be examined, and if choked disc of opposite eye be found, the sinus, brain or meninges will be likely involved.

8. An unusual and unaccountable depression and weakness is very likely to be found in patients suffering from thrombosis, and its presence may be considered contributory evidence.

It is not necessary here to describe the mastoid operation, but having opened up the mastoid antrum and cells and having removed all infective foci in that region, exposure of the sinus is undertaken. This is sometimes very easy,

especially when there has been much involvement of the mastoid and the sinus groove has been eroded; at other times the difficulty is great, but at all times the greatest care must be exercised in removing the bone, to the end that the sinus be not accidentally opened before you are ready; or that the contained clot be not broken by manipulation. Probably the most satisfactory instrument for this part of the operation is the chisel, as with it you are less likely to wound the sinus wall or disturb the clot. The sinus should be exposed as low down as possible towards the bulb and as high up towards the torcular as may be necessary to expose healthy sinus. If, after having exposed the sinus and having demonstrated that it contains no thrombosis, though the symptoms indicate that it does exist, then it is well to expose the jugular bulb and superior petrosal sinus, for in either of these may lie the trouble.

The appearance, the feel and the pulsation of the sinus have ceased to be large factors in determining the contents of a sinus, because they have so frequently been found to be deceptive. Whenever symptoms of septic sinus thrombosis occur, even though the sinus looks and feels all right, it is our duty to open it. The sinus should be thoroughly opened and when healthy walls are found at both torcular and bulb ends of the opening, pressure plugs may be used and the unhealthy tissue resected, but if thrombosis extends down into the bulb or if the lower portion of thrombosis is undergoing degeneration, then it is decidedly the safer move, for the patient's life, to ligate and resect the internal jugular vein before attempting to remove the thrombus; and when curetting the bulb after a ligation of the jugular it is well to make deep pressure on the opposite internal jugular so as to cut out as far as possible the carrying of small clots or debris into the general circulation by aspiration.

Having curetted the bulb and cleansed the sinus as thoroughly as possible, it is well to carry a piece of gauze into the bulb as far as the postcondylar vein, in order to develop a sudden coagulation and an aseptic thrombus in the bulb, and establish a cross current between the inferior petrosal sinus and the postcondylar vein.

Rapidity of action and gentleness of manipulation are almost as essential for a successful outcome in these cases, as is the operative interference. The mastoid operation, the sinus

operation and the resection of the jugular should be done, if possible, at one operation, and with the utmost despatch, as the danger from shock in this trouble is exceedingly great, and the divided operation is not particularly prone to decrease the mortality rate of this disease.

Report of an operation illustrating this complication: On May 6, 1905, I was called by a confrere in a suburb of Los Angeles to examine with him one of his patients, Miss N.N., a physician's daughter, aged 32. From the patient herself, her sister and the doctor I obtained the following history: When 2 years old she had an attack of acute otitis media with profuse suppuration on the right side. The discharge continued for some time before ceasing, and had recurred several times, during her early life, but she had not had an attack or, in fact, any discharge whatever since coming to California, which had been some five years. On Saturday, April 29, on returning from her work she complained of pain in her right ear and a general headache, which increased in severity as the days passed along. On Sunday the ear began discharging, but the pain in and about the ear continued and was quite severe. She had had some elevation of temperature, but no record had been kept. A nurse was called on May 5th and her records show that between noon of the 5th and noon of the 6th, when I was called in consultation, the patient's temperature varied from 99.2 to 105.2; pulse, 93 to 126; respirations, 18 to 34. Free perspiration after high temperature, dizziness, vomiting, small amount of discharge from the ear. Considerable pain in mastoid region, but only slight tenderness on deep pressure over the antrum. No sagging of postero-superior wall of the canal; the perforation in the drum head was just behind the handle, about the size of a pin head. There was no tenderness along the course of the internal jugular nor was there any lymphatic enlargement. Diagnosis of infective sigmoid sinus thrombosis was made and operation advised as soon as instruments could be obtained and house prepared.

It was thought the danger was too great to have her brought to Los Angeles to a hospital, a distance of some twelve miles. So we utilized the dining room, which the nurse made as aseptic as possible. We operated at 5:30 that afternoon. The mastoid was carious throughout. The antrum was large and filled with pus and cholesteatomatous mass. Deep in the

substance of the mastoid, and extending from the antrum to the sinus groove at the knee, was a strip of softer bone, which was probably the line of infection. The sinus was carefully uncovered (the overlying groove being softened for about 1-3 inch at the knee along the vertical limb), from above this softened tissue to near the jugular bulb. The sinus wall was dark, lusterless and unhealthy in appearance. Palpation gave no definite knowledge. The hypodermic syringe brought away a few drops of stinking, bloody pus; this decided me to ligate the internal jugular vein before disturbing the thrombus. On exposing this vessel, I found a firm clot down to the entrance of facial vein, and below that point the vein was only partially filled with blood. I ligated the jugular about one inch above the clavicle, and the facial just above its juncture with the jugular and resected up to clot, and the lower end of the neck wound was temporarily packed. Returning to the sigmoid sinus, I slit it open the full extent of its uncovering and evacuated a very offensive, pussy blood, curetted the sinus as far toward the bulb as possible, and succeeded in getting a fair return flow and introduced gauze to the bulb. The clot in the descending limb of the sinus was then gently removed with the curette and a generous gush of blood washed out all infective material, the hemorrhage was at once checked with gauze plug. As the neck wound had ceased bleeding, and the clot in the jugular vein was firm, the wound was closed and the mastoid wound dressed as usual.

During the next twenty-four hours the temperature never went above 99.2, pulse 97, respiration 24, but about six o'clock p. m. the patient had a slight chill and vomited; temperature went to 102.6. At ten o'clock she had chill lasting fifteen minutes; temperature 103, pulse 131, respiration 31, but after a free movement of the bowels the temperature dropped to 99.6 and the patient had restful sleep. At 6 a. m. on the 8th, the second day after the operation, the mastoid wound was dressed because of the more than ordinary oozing. At noon on the 9th the temperature suddenly went up to 100.6 from normal, and as the patient was complaining of some discomfort in the neck a general dressing was done, the upper portion of the neck wound was inflamed so one stitch was taken out and small amount of pus removed; this probably came from degeneration of the unremoved thrombus.

Thereafter the upper portion of the neck incision was treated as an open wound, and the patient went on in an uneventful way to recovery, and at no time did the temperature exceed 100, the pulse 80 to 90 and respiration 18 to 20.

On the 29th the patient took a long drive, and from that time on went to office for dressings.

After resection of internal jugular for sinus thrombosis, it would seem to me better policy to treat the neck incision as an open wound, no matter how clean the parts may be.

DISCUSSION.

Dr. E. B. Dench, New York, thought it a very interesting case, one which clearly showed what good results could be obtained by prompt intervention. He saw a similar case in which there was only a sudden rise in temperature. The entire drum membrane had been destroyed, and if there ever was a case where good drainage could be obtained that was it; yet, on opening up, he found a thrombus extending to the jugular. Iodoform packing was introduced to prevent infection from the broken down thrombus. The patient, a woman, was placed upon the table with a temperature of 106, yet the wound healed by primary union. He does not agree with Dr. Ellis as to the treatment of neck wounds as open wounds in every instance. Half of the cases he has had have healed by primary union; and if the temperature does rise, he advises removal of the sutures and treating it then as an open wound. In this way more rapid healing can be secured, than if the tissues are allowed to be widely separated. In a fairly clean case it is wise, in the speaker's opinion, to suture. Another point he mentioned was the application of a wet dressing, which gives one a firm union of the cut structures, and the deeper part of the cavity rapidly heals. If it is not aseptic, it would drain from the lower angle.

Dr. E. M. Holmes, Boston, reported the case of a boy who had been operated upon by Dr. Leland a week ago. He had been admitted to the hospital on account of two days' headache. He had a running ear for eleven years. The temperature was normal, but the ear was discharging a small amount of pus. There was no tenderness or enlarged glands to be found anywhere. The only marked thing was a subnormal pulse running about 42 to 50. When the mastoid was

opened, the cells were found to be filled with granulation tissue, and the lateral sinus wall was of a darkish blue color filled with pus. Before opening the sinus the jugular was tied and the upper portion dissected out, but there was still a dark appearance of the inner wall of the sinus. Incision at this point was followed by about a dram of pus. Immediately there was cyanosis and artificial breathing had to be resorted to. The patient recovered and is now on the road to recovery.

Dr. E. W. Day, Pittsburg, was very much interested on account of the temperature. Last November he had a case come into the hospital, a boy, who had chronic discharge for years, with intense headaches. He came from school and that night his temperature was 102; he had a chill and went into semi-coma. On his arrival at the hospital, his temperature was 94.6. At no time did his temperature rise above 95.4; the pulse was between 56 and 60. On opening the mastoid, the cerebellum and the sinus were exposed. The sinus was absolutely gone, and at the point of the sigmoid sinus location, no trace of it could be found, but there was much pus and debris. The lateral sinus was thrombosed. The collapsed vein was found and the surface of the dura over the cerebellum, the walls of the lateral sinus and the superior surface of the cerebellum were found necrosed. The patient never recovered consciousness and died with a temperature and pulse entirely subnormal.

Dr. H. L. Myers, Norfolk, stated that his experience in cases of resection of the jugular in sigmoid sinus cases had not been large; in fact, he had done the operation only three times. One of these cases had come into the hospital presenting a marked swelling over the right mastoid region and the ear was discharging freely. Twenty-four hours after admission the mastoid was opened and found in very bad condition; despite this fact, the temperature was normal at the time of the operation as it had been previously when we could examine it.

The ordinary mastoid operation was performed. On the third day the temperature rose, and from the septic look of the child and other signs such as great depression, he determined to explore the sinus. The operation disclosed a badly thrombosed sinus, and after establishing the flow from above and failing to establish it from below, the jugular

was resected from as high a point as possible to near the clavicle, a cigarette drain was introduced and the neck closed. Three days later the temperature took a jump to 103° F., and on opening the dressing he found the neck wound full of pus and the drain doing little service, the sutures were removed, the wound cleansed and treated openly and the patient had a rapid recovery. In every one of the three cases coming under his observation, the neck wound was closed and had to be treated as an open wound afterwards on account of infection, despite the best surgical technic he was capable of. After this experience, he began to feel that it is of little use to close the neck wound at the time of the resection.

Dr. B. E. Fryer, Kansas City, asked if in these cases of subnormal temperature any blood count had been made. He would suggest that a leucocytosis in these cases would be diagnostic. Where there is subnormal temperature, with sepsis involving the jugular, as a rule oscillating temperature prevails, but where it remains down a hypoleucocytosis is an indication of the want of reactive power.

Dr. E. M. Fleming, Los Angeles, reported a case of 100 days' duration. The man came with an acute otitis media, and was relieved after incision of the drumhead. At the end of four weeks, the discharge still profusely present, it was suggested that he would probably not recover unless mastoid operation was performed. There were no symptoms of mastoiditis, and it was suggested simply on account of the persistent and profuse discharge. Operation was refused on the ground that he was a diabetic. During the next thirty days he received office treatment and there was no high temperature. One month after having advised operation he was suddenly seized with two slight convulsions and apparently recovered with ill effects, but still refused operation. Thirty days later he had another seizure, with complete aphasia and a semi-unconsciousness: the operation was again strongly suggested. He was taken to the table and fluid pus was evacuated and the presence of a temporo-sphenoidal brain abscess made out and in Broca's area a large quantity of fluid was found. After the operation the patient died. This condition may exist without typical symptoms.

Dr. E. B Dench, New York, desired to place on record a case of pronounced general chorea in which operation was delayed, although there was suppuration. Choreic convulsions were so violent that the anesthetic was with much difficulty administered. The dura was exposed over the middle cranial fossa, but it was found to be normal. The chorea disappeared after the operation and has not since returned.

Dr. C. W. Richardson, Washington, said that the diagnosis of thrombosis was not always easy, and at times there was considerable doubt. During the past winter he had two cases which would illustrate this difficulty markedly One was a child 9 years of age who was unconscious and in the throes of violent convulsions, with a temperature of 105. The urine had been examined and sugar and casts were found. The physician in attendance called in the speaker simply because the child had had chronic suppuration from the ear. It was at once taken to the hospital and operated upon. An extradural abscess was found with no involvement of the sinus. The most remarkable thing about the case was that the urine ran between 90 and 132 ounces per diem for nearly a week. Another case was the child of a neighboring physician, about 2 years of age, that had been running a temperature three or four days, for which there was no apparent cause. The speaker was called early on the fourth day because the child continually had its hand on the right side of its head. The child was watched for five days, during which time it ran a temperature from 99 to 104 or 105 every day. There was free drainage and no bulging and no tenderness over the mastoid. Blood counts made on the third and fifth days showed no leucocytosis. On the seventh day the mastoid was explored and a typical osteomyelitis was found. The sinus was free, firm and normal. These two cases both suggested involvement of the sinus, yet in neither case was it affected.

Dr. Joseph Beck, Chicago, related two interesting points in a typical case of sinus thrombosis, where it had extended almost two-thirds down the neck and jugular, and where an exposure for the usual radical proceedure for mastoid was done. On the following morning the temperature was 99; it had been 104 before the operation. Three days later the patient had a chill followed by pain in the right side of the

chest, high temperature and a rusty sputum lasting three days. Three days later the condition was repeated on the opposite side, also clearing up after three days. Pneumococci were present in the sputum. He had repeated chills during five weeks with fever and the usual course of a septicemia. Good results were obtained by the hypodermic injection of glycogen in these cases.

Dr. E. W. Day, Pittsburg, showed a few temperature charts from cases of mistaken diagnosis. The first chart was a case of a boy 5 years old who had had measles with a middle ear suppuration. The measles cleared up, but the ear continued to discharge, and he complained of pain in the mastoid. The temperature ran from 90 to 104 and 106 with chill and a good fall to 99, then up to 105 and then below 100 and up and down. The doctor expressed some doubt that it might be sinus thrombosis. An expert was sent for and the child examined and he diagnosticated pneumonia. Nothing was done to the mastoid, the pneumonia cleared up and the patient recovered.

The next chart was in a case of measles; the child had apparently been healthy for two months prior to the time spoken of. Each afternoon the little girl would say she felt tired and wished to be held. Suddenly, one Sunday night she complained of pain in the ear with profuse purulent discharge. She immediately began to run a temperature of 102, falling to 99 and rising in the afternoon to 103 and zigzagging, until, ten days later, when the glands along the neck became swollen and tender over the mastoid. The case was examined by four other physicians and no complication could be detected. As it was the doctor's own child he could not bring himself to the point of having it operated upon. Five days later the opposite glands and the inguinal glands became swollen. The blood count showed 23,000 leucocytes, the polymorpho-nuclear cells were 63% and the hemaglobin 50%. Dr. Litchfield thought it a case of malnutrition and that the ear was simply a manifestation of that condition. Operation was not performed and the child recovered.

The next chart is of a little patient seen the latter part of March. He had measles with ear trouble. A month later the mastoid was bulging and the patient was operated upon, but instead of getting better it grew worse. The other mas-

toid was opened, but still it remained in a bad condition. Pus was found in both mastoids. The chest was thoroughly gone over. The blood count showed 63% polymorpho-nuclear cells and the leucocytosis was 27000. Sinus thrombosis was then suspected, both sinuses were opened and both were absolutely normal; the temperature then began to zigzag. Typhoid tests were made, but they proved negative. At the post-mortem the veins of the brain were found to be slightly congested. When the sinus was opened a probe was passed and a free return of blood was obtained; but in the right sinus a non-adherent clot was found, having its origin and fastened to the point that was cut. In the lungs, lying between the pleura and pericardium, a pus sac was found the size of a hen's egg. The right lung at the upper portion showed an old pneumonia, and below it a recent pneumonia and in the left lung a still more recent pneumonia. The doctor thought that in many of these cases in children, the fact was overlooked that a great many other conditions gave rise to the symptoms simulating thrombosis of the sinus. He believed that very often in children and babies a condition is present that was referable to the respiratory tract and which cannot be diagnosed, and too much pressure is brought to bear on the sinus thrombosis theory and the other conditions overlooked.

Dr. J. A. Stucky, Lexington, said that Dr. Day had brought out the point he had tried to emphasize at Buffalo last June: that the symptoms caused by intestinal toxemia simulated those of sinus thrombosis as far as temperature showed. He has never opened the lateral sinus. The septic condition of the mastoid present, plus the condition produced by the anesthetic, so weakened the intestinal canal that the toxines are absorbed and the symptoms of sinus thrombosis are made manifest. Two or three doses of castor oil and a colon tube, he thought, performed wonders.

Dr. Wendell C. Phillips, New York, wished to protest at the unwarranted operative interference in suspected cases where the diagnosis was based upon high temperature only. Young children previous to rupture of drum or paracentesis were extremely prone to high temperature, which usually subsided promptly a few hours after a free opening in the drum had been made. These cases also usually had a high polymorpho-nuclear percentage.

Dr. E. M. Holmes, Boston, said regarding the blood count, one case showed 11000 white and the next day there were be but 9000 and on the third day after operation 14000. It was not always absolute.

Dr. J. F. Barnhill, Indianapolis, thought there was a possibility that Dr. Day's case had a lateral sinus thrombosis which was taken care of by the child's own system.

Dr. E. B. Dench, New York, said there were some cases that did well without operation. He had found in oné case the lateral sinus absolutely obliterated, yet the patient recovered. He had a case, a child, 18 months old, for whom he was consulted, who had an unexplained temperature. He performed double paracentesis, and after seven days the temperature rose to 107°. Two careful diagnosticians went over the chest, but said they found nothing. The leucocyte count was 27000 and the polymorpho-nuclear 87%. The next day the temperature went down to 99 and the child gradually recovered. Another child of 18 months had run an irregular high temperature for five days. For the first three days there were no ear symptoms. Incision; staphylococcus infection present; no drainage. Three myringotomies were performed. There was no tenderness over the mastoid, but there was swelling of the canal. Everything else was excluded. The blood count had been made and a high leucocytosis was evidenced, so pneumonia was sought after. The day following the polymorpho-nuclear were down to 29%. The mastoid was opened and was found to be filled with pus, yet the bony wall was firm. Forty-eight hours later the sinus was opened and a clot found extending from the knee seven-eighths of an inch to the torcular Herophili. The wound was packed and the temperature began to fall. Sixty hours after the operation, at the first dressing, there was a slight amount of pus, of which the speaker was afraid. That night the temperature again rose to 107, but the following morning at 7 it was down to 99, and the jugular vein was excised from the innominate to the base of the skull. It was like a pipe stem. The child died ten days later of sepsis.

PAPER:

THE SUBMUCOUS RESECTION OPERATION ON THE NASAL SEPTUM.

JOSEPH C. BECK, M. D.

Possibly no operation in the nasal cavity has received so much attention as the submucous window resection; it seems to me that, were it not for the fact that this is a symposium, where a thorough discussion of the various methods of operating on the nasal septum is to be considered, another paper on the subject would be superfluous. I have attempted in this paper to take up the various steps of the submucous operation, stating the advantages, its difficulties, and suggestions as to all the difficulties and how they may be overcome. In this connection, I have done some original work in so far as I am able to learn from the literature, that is, the diagnosis as to the consistency of the nasal septum, which I will take up later.

The history of the operation is well-known, and the mention of the names of Krieg, Boeninghaus, Ingals, Freer, Hyde and, last but not least, Killian, will suffice to recall the progress of this operation. Killian has done much to simplify the technic of this operation. His cartilage plow, later so ingeniously modified by Ballenger, has made the operation comparatively simple and rapid, so that the former dread of its tediousness has been entirely removed. Credit belongs to every man who has thus far written on the subject for adding another little point, thereby doing a better and simpler operation, until now a fairly good technic is established.

Freer once stated in discussion that so far as he was concerned, there was but one operation for deviated septa, and that was the window resection.

With some of the rarest exceptions, I will admit that that is also my present conclusion as regards choice of operation.

I performed a Gleason operation in July, 1904, for the last time, and in September of the same year the last Asch operation. Since that time, no matter what kind of deviated septum I had to deal with, I always started out to do the sub-

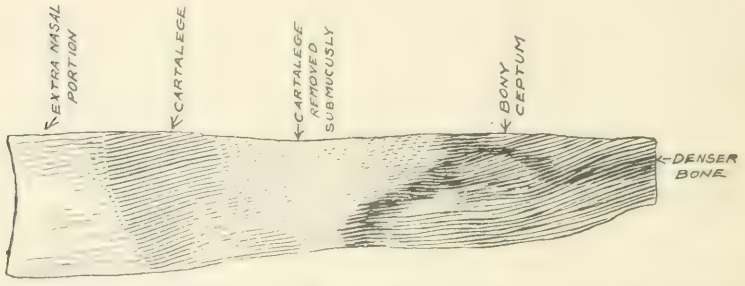
mucous resection, and in but three instances did I supplement the incising of the septum with the additional use of Adams' forceps. One of these cases is of sufficient interest to justify a brief description. A boy, 6 years old, who had a marked anterior deflection of the septum and adenoids, was prepared for the submucous operation, and after incision into the mucous membrane was made, a careful dissection was made until the cartilage in its whole extent was liberated. An incision through the cartilage was just finished, when the boy collapsed and all symptoms of shock were present. I placed the patient on a table, and with the usual restoratives revived him. The pulse being exceedingly slow, I hesitated to use any more anesthesia or give a general anesthetic, and consequently completed the operation in the following manner: I introduced a Freer septum knife under the mucous membrane and turned at right angles, incised the deviated septum three times in the horizontal manner, then introduced the Adams forceps, fractured the septum, and introduced the splint. In this way I did a submucous Sluder operation. The septum healed very kindly, and a fairly good result was obtained.

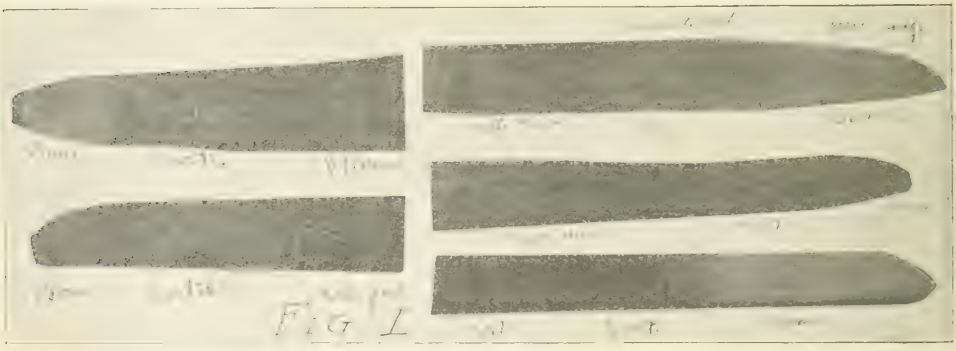
The varieties of deformed or deflected septa require a technic specially adapted to each individual case as to whether it be bow-shaped, S-shaped, or marked irregularities; whether it is in a cartilaginous, bony portion, or both; whether there be a dislocation and protrusion of the anterior triangular cartilage; whether a maxillary ridge is present, bone or cartilage. Also, what is the consistency of the septum; whether thin or very firm? Are there any associated pathologic conditions of the septum and other intranasal structures present?

Most of these points can be fairly well established by inspection and palpation. However, the density of structure of the septum, whether bony or cartilaginous, particularly the ridge, cannot be so determined, and I have thought of a method to aid in its determination. Permit me, therefore, to make a preliminary report of this method, which I will describe more exhaustively in a subsequent paper; namely, intranasal, postnasal and tympano-mastoid radiography.

The technic of making a radiograph of the septum is as follows: First, introduce a sensitized celluloid plate, wrapped with post-office paper and covered externally with a wax paper, as far back as the posterior pharyngeal wall, allowing a

small portion to protrude from the external naris. The film is about half an inch in width and three inches in length, in the shape of a nasal splint. These plates one can readily cut according to the size of the external naris. The larger the naris, the wider the plate which can be introduced, and this is a distinct advantage. Two plates may be introduced, the one above the other, in that manner taking the entire septum. The plate is usually placed near the floor, in close proximity





to the ridge. However, it may be placed over any portion which it is desired to reproduce. In case the parts are very sensitive or swollen, cocain and adrenalin should be used before introducing the plate. The various materials which I have used are bromid paper, kodak films, glass plates, and sensitized celluloid. The films and celluloid plates are preferable, owing to their pliability and because they retain sufficient firmness for introduction. Positive prints may be made from these, if desired.

The accompanying negative (Fig. 1), with illustration, shows in the first place the portion external to the nasal cavity,

which is very dark; secondly, the cartilaginous portion of the septum, being lighter in color; and, finally, the bony portion of the septum, which shows almost no shadow. The denser the cartilage, the lighter it appears, and similarly according to the thickness or classification of the ridge. Its shadow varies in intensity, thus corresponding with certain fundamental principles of radiography.

Such conditions as perforation and cases after the submucous operation has been performed show distinctly as dark areas and one may possibly, with a very low tube, determine regeneration of cartilage between the two muco-perichondrial layers.

The reasons for always choosing to do this submucous method in preference to all others are obvious to any operator who performs it.

1. In the first place, the operation can be done in almost every instance under local anesthesia, with comparatively little pain, shock or discomfort to the patient.

2. Hemorrhage during and subsequent to the operation is usually very slight.

3. The after-treatment is so very simple, not annoying to the patient, and shortened by many weeks.

4. Only one side of the nose is attacked, and the patient breathes freely through the other nostril while the operated side is healing.

5. The results are obtained with the destruction of a very slight area of functionating mucous membrane and cicatrices and crust formations are not present in the same degree as in other methods of procedure.

However, there are many difficulties entailed in this operation that require skill and judgment to overcome, and I hope that to-day's discussion will clear up many of them.

First. The first difficulty that one meets after incising the mucous membrane, especially if very anteriorly, is to dissect up the muco-perichondrium. This difficulty is best overcome by the use of Freer's sharp elevators. This portion of the septum is also very hard to anesthetize by topical application of cocain. The patients complain some until the first step is completed. I find that a few drops of eucain solution with adrenalin, half to one per cent, injected by the Schleich method, assists in this procedure.

Second. The muco-perichondrium is, as a rule, very firmly adherent to the maxillary ridge, and the closer to the floor the more difficult to dissect. Oftentimes, at this step, the membrane is torn by the various dissectors, and a great deal of time is necessary to liberate the ridge.

I have been using an admirable method of dissection which these drawings indicate (Fig. 2), (Fig. 3), namely, take a

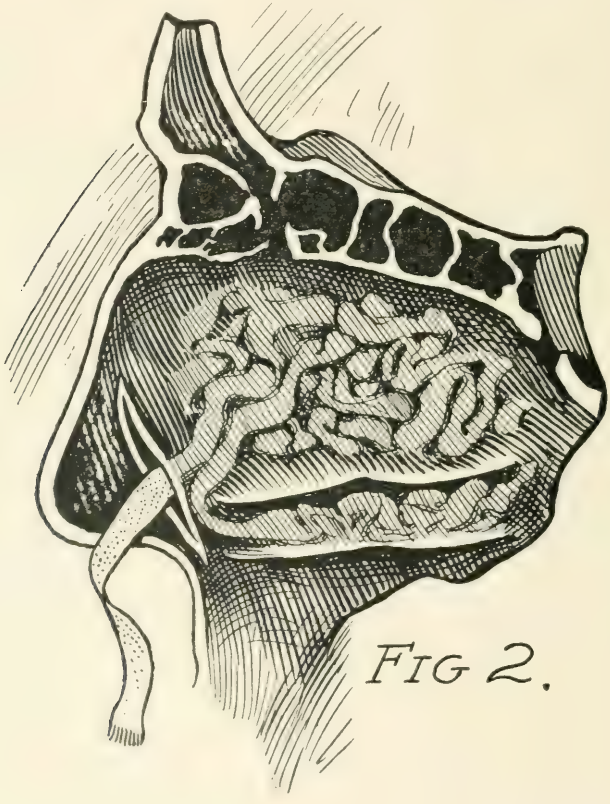


FIG 2.

very narrow tape and introduce it into the little pocket made by the first dissection of muco-perichondrium, and with one of the small elevators pack it quite firmly between the cartilage and muco-perichondrium as far back as desired, above the ridge, and another strip below it. In this manner one does a blunt, safe and bloodless dissection, being less disagreeable to the patient than the elevator. After the cartilage is cut

through, and to overcome the danger of cutting the mucous membrane on the opposite side, I use a wedge-shaped septum knife (Fig. 4). I again introduce the tape and pack until the muco-perichondrium is entirely lifted off as far as necessary. When these procedures are completed, I remove all the tape and the muco-perichondrium on both sides balloons out so that the introduction of the swivel knife is very easy.

Third. In cases where an operation such as removal of the ridge or spur, has been performed before, it is most difficult to peel off this layer of scar membrane, and most of the time it is torn in shreds in this procedure.

Fourth. There is an additional difficulty in dissecting off this portion of the mucous membrane in cases where there existed an old catarrhal ulceration, healed by the usual cauterization method.

Fifth. It is the custom of most operators to work from the convexity, no matter what side it be on. However, it is difficult to operate from the right side.

Sixth. I was confronted once with this particular difficulty that may never occur again: In a case of a man with a marked deviation of the cartilaginous septum to the right, causing almost complete nasal obstruction on that side, and associated tubal catarrh, I had the following pathologic condition to consider: Bleeding polyp on the left side of the nose. The merest touch caused very free bleeding. There was a scar on the dorsum of the nose from an operation performed by a so-called beauty doctor for cosmetic purposes, to remove a hump. You observe that I was compelled to work from the right side of the patient, owing to the bleeding polyp, and I was forced to be very careful not to remove too great an extent of the septum for fear of a possible sinking-in of the nose, inasmuch as I did not know exactly what was done by the cosmetic doctor.

Seventh. One of the greatest difficulties with me is the removal of the bony septum. The little maxillary ridge can easily be removed by various methods. Mine is by the use of an automatic chisel. But it is the posterior portion of the bony septum to which I refer. The instruments that are in use at present are either not strong enough or so small that one must enter between the muco-perichondrial layer, or so large as to obstruct one's vision and endanger the muco-perichon-

drium. The Foster-Ballenger forceps up to the present time answers the best purpose, but as said before, it obstructs the vision and I have been working in this line to overcome this difficulty. Allow me to present a sketch of a forceps that is in construction, and I should be very happy if some of the gentlemen in discussion will make some suggestions as to improvement. It is based on the principle of an obstet-

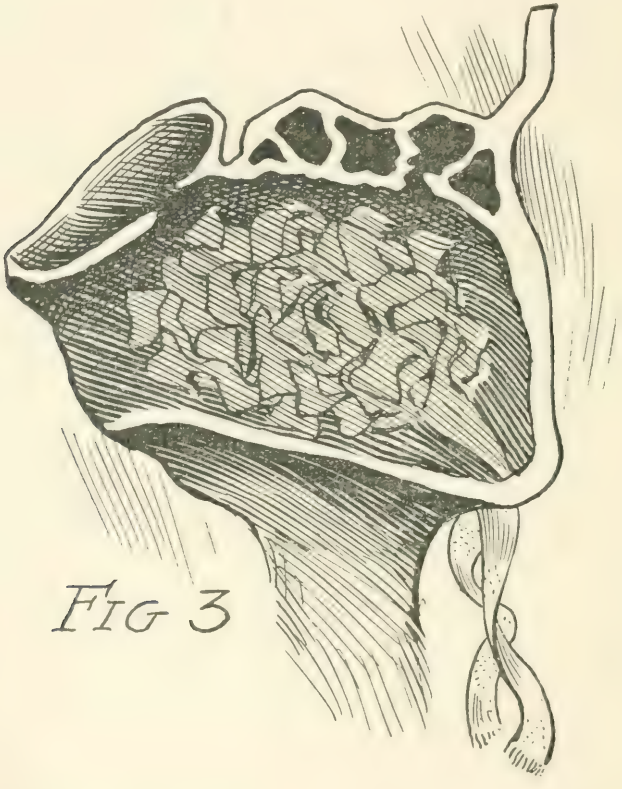


FIG 3

rical forceps, introducing one blade at a time, engaging as large a portion of the bony septum as requires removal, and taking it away at one clip; if not all has been removed that is necessary, it may be reintroduced and the operation completed.

The lock of the forceps can be displaced forward and backwards.

Eighth. After all the septum has been removed that is necessary and the flaps brought back in apposition, there arises often a difficulty in keeping them in this position while packing the nose. I find that I can very easily overcome this difficulty by introducing the speculum clamp until the packing is completed.

Ninth. All of us see cases that are spoken of as cocain poisoning, shock, fright, etc., which must be considered in these operations, since most of us have the patient sitting up. The best way to obviate this difficulty is to be ready to lower the patient, or to put him on the table at once, and go right on with the operation. Of course, the source of light is the most important point in this procedure, and the Kirstein lamp is the one I have been using with satisfaction.

Tenth. If during the progress of the operation one should perforate into the opposite side of the nose, there arises the difficulty of continuing the dissection of the membrane, and I am accustomed in such instances to terminate the operation at this point, allowing the conditions to heal, and operating eventually at another time, possibly from the other side.

Eleventh. I have had a case of a bleeder unrecognized until I made my incision; after repeated application of adrenalin and pressure, I was unable to check the hemorrhage long enough to proceed with the operation. I did not operate a second time, so this may be counted as another difficulty in this operation.

There are certainly many more difficulties that arise, but I believe that I have mentioned the principal ones. So far as the technic of the operation is concerned, I believe that each case presents certain peculiarities that are present before and develop during the operation, so that one has to judge for himself; besides, each man has his own particular methods and instruments to his liking. My technic has been about as follows:

1. Thorough cleansing of the vestibule.
2. Douche with a mild, alkaline, antiseptic solution.
3. Cocainization by 20 per cent. solution and adrenalization, 1-1000, both sides from five to ten minutes. Also subperichondrial injection by Schleich method with eucain-adrenalin, to the most anterior portion of the septum.
4. Application of the operative nasal speculum.

5 Incision, usually the Killian, of the muco-perichondrium, in front of the deviation.

6. Dissection, first, by Freer's sharp elevators, then by tape packing.

7. Incision through the cartilage.

8. Separation of muco-perichondrium on the opposite side by packing with strips of tape.

9. Removal of the packs, introduction of the swivel knife and removal of the cartilage.

10. If a ridge is present, remove by automatic chisel.

11. Removal of bony septum by bone forceps.

12. Readaptation of the flaps.

13. Introduction of clamp to hold flaps in position.

14. Packing the nose lightly with vaseline-covered gauze,

The after-treatment: The removal of the gauze the next day, by first spraying it with a warm alkaline solution facilitates its removal. If the flaps are not yet adherent, I re-pack the same as after operation. Usually after the third day I leave off the packing and use mild cleansing solutions for a few days. As a rule, after one week or ten days the patient is discharged as cured.

In case some of the mucous membrane has been destroyed, or if an imperfect adaptation has taken place, a granulating area may be present, which usually heals very easily a few days later by the use of nitrate of silver cauterization.

The complications that may or do arise are:

1. Infection, either primary or secondary, as extension to the sinuses, naso-pharynx and middle ear.

2. Hematoma.

3. Hemorrhage, primary or secondary.

4. Perforation.

5. Sinking in of the nose.

The first complication, namely, infection, is very rare compared to that following other methods of operating, and I have had but two cases, both where I had used a stitch to hold the flap in apposition, and consequently I have given up this procedure.

Secondary hemorrhage occurs usually from infection.

Hematoma has occurred in cases where the flaps were not properly held in approximation by good packing.

Perforations are complications that follow in one's early experience with this operation, when not using the proper

instrument, and are oftentimes unavoidable in conditions mentioned before: very large prominences, ridges, or sharp concavities, with firm adhesions of the mucous membrane, and very thin mucous membrane.

Sinking-in of the nose I have never seen following this operation, but I have seen it follow an Asch operation. We are told to leave a small portion of the cartilage, about one-fourth of an inch along the anterior portion of the septum from the junction of the nasal bones to the tip.

The indications for this operation are those of nasal obstruction to breathing; ventilation of the sinuses, and middle ear; also to correct certain nasal deformities. The contraindications are those that would contraindicate any nasal operation for instance, infection about the nose, hemophilia, marked general debility, etc.

PAPER:

SUBMUCOUS RESECTION OF THE NASAL SEPTUM.

CHEVALIER JACKSON, M. D.,

The submucous resection of the nasal septum is so finished and attractive in its technic, and so perfect in its results, compared with the rougher, cruder, older methods, that we are tempted to operate upon the septum while overlooking more pernicious intranasal conditions. In many cases the septal operation constitutes but one step in the relief of the patient's nasal disease.

Septal cases do not come to us to have their septa straightened. They come for the relief of symptoms due to one or two or all of three things: nasal stenosis, defective drainage, or contact of surfaces which normally should not touch. Therefore it is not an artistic but a therapeutic goal we should strive for. The septum is not the only portion of the nasal chamber that can be operated upon. Relief in many cases can be better attained otherwise than by septal operation. In other cases it will be necessary to advise the patient in the beginning that several operations will be necessary, as other conditions than the septum also require surgical treatment.

As to the after-results of submucous resection, the writer has seen nothing objectionable save in one case that was operated in another city. In this case there was a decided saddle deformity, but it was due not to the operation but to luetic necrosis of the remaining cartilage. This emphasizes what the writer has always urged, namely, to let alone the septum of the patient with a luetic history. We all know the insidious, painless onset of luetic chondrial necrosis and how rarely the patient comes early for treatment. Should deformity thus result, even years after operation, it will all be attributed to operation.

It has not been necessary in any of my cases to approach so closely to the anterior limit of the septum as to endanger support of the bridge. The writer doubts if it is ever neces-

sary to remove the quadrangular cartilage forward closer than to within 7 millimeters of the lateral cartilages of the nose, in order to relieve the patient of his complaint.

The writer's submucous resections have been uniformly successful, and in no case has he had a persistent perforation. In six cases, the mucoperichondrium of the opposite side was perforated, but in every instance this was closed by a stitch or a little plastic work, the latter being necessary in the only case where the perforation was opposite the incision. No sloughing of the flap occurred in any case.

A case of laryngitis dependent upon mouth breathing due to nasal stenosis came to the writer on the eve of moving to another city. I advised operation, but placed him under the care of a good operator in the city to which he was going. A year later he moved back to Pittsburg, where in a month, what little relief he had had from my confrere's beautiful septum operation disappeared, and he demanded that his nasal breathing be restored. The removal of the hypertrophic turbinal on the formerly concave side, completed the cure. This case is mentioned because too much stress, it seems to me, is being laid upon the diminished thickness of the submucously resected septum. The combined nasal cavity, which the septum divides into two, is not of fixed size but fluctuates in the area of its cross section almost every minute of the day, due to the fact that its outer wall is made up largely of four expansile bodies, the turbinals, whose size varies with the humidity of the inspired air, the general blood pressure as influenced by exercise, emotion and innumerable other things, and the local blood pressure, as influenced by posture, irritation of inspired particles, vaso-motor influences, etc., and this whether intumescent or hypertrophic rhinitis be present or not. For this reason a little bulk more or less of the septum is a matter of little consequence, and it must not be hoped that removal of the lateral bulk of the septal cartilage or bone will be sufficient to obviate stenosis when turbinals in a state of vaso-motor paresis occupy the external walls.

It is wise in most cases to resect the inferior turbinal on the concave side, not only to allow room for the corrected septum, but because the comparatively enormous inferior turbinal is itself the cause, in some instances, of the deflection which it will reproduce if not removed. Whether intumescent rhinitis, vaso-motor relaxation of the vessels and passive engorgement

of the venous channels are as common elsewhere as in Pittsburg, the writer is uncertain, but he has seen so often the swollen inferior turbinal in tight contact with the septum, especially on the pillow side, while the patient is asleep, that he has always attributed his successes in the older and newer methods of septal operation to a preliminary resection of the inferior turbinal.

Operating Room.—It is unjustifiable to do these or any other operations in the nasal chambers unless every detail of aseptic technic is carried out. The best results cannot be secured easily in an office unless a trained nurse, sterile gowns, towels and other paraphernalia of an operating room are provided. The day of intranasal pottering in an office is past, and the day of intranasal surgery in an operating room is here. By this the writer does not mean that good work cannot be done in an office. Careful endless detail work can overcome obstacles anywhere, but the man who has much operative work to do, and who records his results, will soon find it expedient to examine and treat his patients in an office and operate on them in an operating room. Incidentally it may be said that his records will show also that most of his cures come from the operating room. Any rhino-laryngologist who becomes accustomed to operate on recumbent patients will never go back to the old way of the sitting posture. He will do better work, have fewer syncopes, fewer cocaine accidents, and, above all, be able to do his work as well with a general as with a local anesthetic.

Armamentarium.—The occasional operator will find the two elevators of Hajek, the Ballenger knife and swivel knife, the Foster-Ballenger forceps, Hurd's or McCoy's forceps for the maxillary ridge, and the Foster septum speculum sufficient special instruments. But the operator who is doing work every day, and who expects to encounter and deal with every difficulty without failure, will need in addition all of Freer's instruments. All instruments except forceps should have straight shanks.

In regard to the argument that a multiplicity of instruments is troublesome, the writer may answer that it is not so, if the operation is done in an operating room, with an ample sterile table in reach, and a sterile nurse to keep the instruments in order, besides the sterile assistant or nurse who sponges. A Beck's speculum or Freer's retractors are convenient, but most

of the writer's work has been done with a bent wire spring speculum, which resembles an ophthalmostat, slight upward traction being made by the nurse.

The forehead mirror so convenient for office work is impossible of asepsis, needs readjusting every time the patient, the operator, or the source of light changes. The large lamp devised by myself for mastoid and general operative work gives too diffuse a light, and is above the line of sight.

A small electric headlight is a necessity. Kirstein's is excellent. The little lamp devised by Dr. Wendell C. Phillips is so small that it can be worn between the eyes in the visual plane, thus always shining where you look. It was originally devised for battery use, but can be used with a proper rheostat on any lighting circuit.

Preparation of the Patient consists, besides a preliminary purge, in having him wash his face with soap and water, rinsing first with sterile water and then with weak mercuric bichloride solution. The vibrissae are all clipped closely and the vestibule is swabbed out with soap and water and then with mercuric bichlorde solution. Under no circumstances is the interior of the nasal chamber sprayed or irrigated. If pus or crusts exist in a case demanding operation, they are wiped away with swabs wrung out of weak mercuric bichloride solution. The nasal mucosa is normally washed by the constant flow of sterile secretions poured out of the glands. The more you attempt to sterilize it the worse you make it.

The patient's forehead, eyes and nose to the alae are covered by a towel wrung out of mercuric bichloride solution, and a similar towel is laid over the lower part of the face, covering the mustache, if present, at any rate the upper lip close up to the alae. Thus the anterior nares are surrounded by not only sterile, but antiseptic towels. In this way the operator's hands remain sterile, which they never can be if they touch the patient's face. If the patient has to expectorate blood, it is done into a towel put up under the wet bichloride towel which covers the mouth.

Anesthesia.—It is the writer's custom in all intranasal operations to pack the nasal chambers with a mixture made of equal parts of 8 per cent cocaine solution and adrenalin chloride 1:1000 solution. This makes a 4 per cent and a 1:2000 solution. It is uniformly successful and only requires to remain six minutes. If the operation is to be done under local

anesthesia, the nasal chambers are repacked for another five minutes. If under general anesthesia, the first and only packing is allowed to remain until the patient is ready for operation. This gives a nearly bloodless field, especially if chloroform and not ether is used. Under ether there will be considerable bleeding, but not enough to prevent good work.

The Method which has yielded me the best results, and which has been the most frequently applicable, is as follows:

The Hajek or Killian anterior incision according to the case —mucoperichondrial elevation by Freer's elevators—removal of the cartilage by the Ballenger swivel knife—removal of the excrescences of the intermaxillary ridge with Hurd's forceps —removal of the vomerine ridge and vomerine or ethmoidal deformity or exostosis with the Foster-Ballenger forceps.

In those cases with sharp angular deflections of the cartilage, the foregoing method may be modified by dividing the cartilaginous resection into two steps, the first to the ridge. These are the operations that would seem advisable for the beginner at submucous resection, and he must select at first cases of simple deflection, limited to the cartilage. With increased skill he may be able to cope with deformities of bone, spines, spurs and crumpled septa with this method. But many cases will be more easily and better done by the Freer incisions, following the crest of the ridges or angles, being single or reversed L, or inverted T-formed, as following the summit demands. In cases of bony, crested deflections far back, the incision must be anterior to the deflection. In all cases the writer makes his incision on the convex side.

Where synechiæ exist, the writer has always first resected a large portion of the outer wall, allowing time for healing, preliminary to the septal operation.

In my opinion the point made by Ballenger that the fewer introductions of instruments into the membranous pouch the better, is well taken.

Primary union is essential. Therefore the greatest care should be exercised that no fragment of bone or cartilage, or filament of cotton or gauze be left in the intermucoperichondrial space. For this reason cotton mops should be wrung out of weak mercuric bichloride solution, and should never be used dry. Biting forceps must be removed after every nip and the detached fragment of bone or cartilage removed be-

fore the instrument is reintroduced. Fenestrated forceps have to be watched very closely in this regard.

The writer has always packed both sides with iodoform gauze to prevent secondary hemorrhage, not because of loss of blood, but to prevent hematoma with consequent defeat of the operation, by adventitious tissue when the clot becomes organized, or by defeating primary union should the clot break down.

In a few of the writer's early cases he placed stitches, but he never saw that they did any good, and he has never regretted omitting them. In cases where the opposite side has been accidentally perforated, the writer always places a stitch, if necessary, to drag the flap of the incised side to a position where it will cover the perforation and prevent the incision and the perforation from coinciding. In this way he has prevented a perforation in six instances.

The writer's custom is, when a general anesthetic is given, to remove as much as necessary of the inferior turbinal of the concave side after the septal operations, which latter is done from the convex side, and then pack both sides, thus completing the entire cure of the case at one operation. This is a great saving of time, and is a great satisfaction to most patients.

RESUME.

As with any other septal operation, resection of the hypertrophic turbinal, middle or inferior, of the concavity is an essential preliminary.

Where synechiæ exist, resection of the outer wall should be done first, allowing an interval for healing. Incisions may be Hajek's or Killian's, but sharp angles require Freer's incisions on the crest, or, if far back, anterior to the crest. Careful elevation of the mucoperichondrium is essential. More perforations occur from failure to elevate from the entire field prior to the attempt to remove cartilage or bone, than from any other cause.

The cartilage should be cut through with a sharp knife, not scratched through.

A complete operation, extending back into the bone, where this participates in the deformity, is usually necessary.

The Contraindications are:

(a) A luetic history. (b) An acute rhinitis. (c) An acute sinusitis. (d) An organic disease, such as of the kidneys, liver, heart or lungs. All these are prohibitive.

Less urgent contraindications which render it desirable, if possible, to relieve conditions by other than septal operation, or, in some instances, by other septal operations, are: (e) Chronic purulent rhinitis. (f) Chronic sinus disease. (g) Large cicatrices or large perforations due to a previous septal operation, disease or trauma. (h) Old age, and childhood.

So far as mechanical operative difficulties are concerned, the writer has seen no case of septal deformity short of complete bilateral atresia which could not be corrected submucoperichondrially; but the advisability of so doing is questionable in the presence of one or more of the foregoing contraindications. By this it is not meant that such cases cannot be operated on with a good percentage of successes. But the writer is giving reasons for his having been perfectly successful with all his cases.

In no case has the writer had a persistent perforation. In six cases the mucoperichondrium of the opposite side was perforated, but in every instance this was closed by a little plastic operation by which a stitch dragged the flap over the perforation, so that the perforation and the incision did not coincide. The uniform success of the writer's submucous resections is attributed by him to the following essential rules:

1. Careful preliminary study of the case to determine: (a) What operation other than septal is required. (b) Which method of septal procedure is best adapted to the particular case, nobody's operation being followed, but one devised to meet individual conditions present.

2. Primary union in every case, insured by: (a) Thorough aseptic technic in an operating room. This technic includes: the use of a miniature electric head lamp for light; sterilization of the vestibule, which is surrounded by sterile towels wrung out of mercuric bichloride solution, these towels covering the face completely; a sterile nurse or assistant for sponging, besides a nurse for unsterile other duties. (b) Close coaptation of the lips of the incision. (c) Care that no foreign body, as a bony or cartilaginous chip or thread of cotton or gauze, be left in the wound. (d) The avoidance of submucous injections.

3. The avoidance of haste, the necessity therefor being obviated by: (a) Avoidance of syncope by recumbency, the patient being on a low table, adjustable to the Trendelenberg position, and the operator sitting on a stool of suitable height. (b) The saving of time usually wasted in constant adjustment of the head mirror, an electric light being used instead; and (c) The setting apart of not less than one hour for the operation, upon which nothing is allowed to intrude.

PAPER:

RESULTS OF OPERATION UPON THE NASAL SEPTUM BY MEANS OF VARIOUS INCISIONS.

J. F. Barnhill, M. D.

My paper on this division of the subject of septal operations will be based largely upon my own personal experience in nasal surgery. At the time of my debut into this field of practice the following were the chief surgical procedures that were available for septal operations: Blandin's punch, which so perforated the septum as to leave a permanent opening through it. Adams' operation, which consisted of making an incision along the whole crest of the flexure, and then forcing the septum into line where it was held in place by mechanical means until union of the incised and crushed parts took place. Steele's operation, in which the multiple knives of a forceps made the stellate incision through the septum, after which it was replaced as in the Adams operation; Ingal's operation, in which the deformity was partially dissected out by submucous procedures, and which seems to have been the earliest of all submucous methods; Jarvis' transfixion needle and snare, by which the cartilage was cut away by means of the cold wire snare; the Roe operation; the Roberts operation, used by incision and fracture of the part, and subsequent support by means of a pin driven through the nose, or by ivory plugs worn in the nostrils; and, finally, the Bosworth operation, by means of a nasal saw.

Bosworth's book, issued in 1888, so earnestly and convincingly advocated the use of the saw as the most logical and successful method of dealing with septal deformities, that I very naturally followed this able teacher from the beginning, and have continued to do so in selected cases ever since. Bosworth seemed not to distinguish between cases of uncomplicated deflection and those of uncomplicated thickening which constituted nasal spur. So far as one was able to judge from a description of this saw operation, this author employed the

one instrument in every case, regardless of the class of deformity to which it belonged.

I have not kept a complete record of the actual number of cases of septal deformity that I have treated during my whole experience in nasal surgery. I feel safe in estimating the number as high as two thousand, but believe in fact that it will greatly exceed that number. Neither have I an accurate record as to the number of successes or failures resulting in these cases, but I do have the unmistakable feeling and belief concerning this point that the percentage of cases that were satisfactorily relieved or entirely cured by the use of the nasal saw is as great, I am even ready to say greater, than has resulted from any other nasal operation I have ever performed. Of course, it should be understood that when I speak of relief or cure in this connection, it is meant that such result was attained frequently from combined operations upon the turbinates or ethmoid as well as upon the septum. However, the cure in so far as the septum itself was a factor, was complete from the mere saw operation, inasmuch as the obstruction was thereby removed and complete healing of the operated area was satisfactorily accomplished.

As might be expected, my greatest number of failures occurred in my earliest cases and before I had learned to select with accuracy those for which the saw operation was most certainly the proper procedure, for it is needless to say that the nasal saw never was, and never can be, a proper instrument to use for the correction of any considerable percentage of septal deformities. From the first I never considered it of value in the purely deflected type of septum, hence never used it to correct such irregularity, and consequently have no bad results to report therefrom. It was in septa, however, where there existed a spur in addition to a deflection that I met with difficulty or failure, because in my desire to remove as much of the obstruction as possible by means of the saw, I sometimes cut too deeply and thereby caused a perforation. More extended experience enabled me to avoid this accident and for a long time I have witnessed no such occurrence.

Of the Bosworth or saw operation I desire to say that no newer procedure has supplanted it in my estimation either for ease of performance or satisfaction in results. But it is only applicable to cases of simple spur, or where but slight deviation complicates such a spur.

Until 1893 I attempted the correction of all uncomplicated septal deflections by the method of first using the Steele stellate septal punch, subsequently pushing the deflected portion as nearly into the median line as possible, and then retaining it in position by the Roberts' pin. The result was in no case absolutely satisfactory and the most perfect outcome obtainable by this measure would compare most unfavorably with those now more easily secured by the Asch operation or any of the several methods in use for submucous resection. Some of the cases were entire failures, owing somewhat to my lack of experience, but largely as I believed at the time, to the fact that the punch or stellate forceps of Steele broke up the resiliency of the septal cartilage over too small an area, and too imperfectly, and the consequence was that the Roberts' pin which was supposed to support the septum in its new position until union of all the cut surfaces had taken place, was crowded upon to the extent that the part of the pin which was imbedded in the cartilage and soft parts of the structures, and emerged externally somewhere near the attachment of the nasal cartilages to the nasal bones and superior maxillary spine, was gradually forced outwardly, the shaft of the pin cutting its way through all the intervening tissues, until the septum reached a position almost if not quite as bad as that occupied before the operation. The results that were obtained when splints were used to hold the septum in place after it had been first incised by the Steele's punch were no better, because the resiliency of the septal cartilage not having been sufficiently overcome by these preparatory incisions, splints of whatever shape or material were too painful to be long endured, and produced ulceration upon the height of the convexity of the septum which in some cases caused adhesions to the opposite turbinate.

In 1896, Gleason published his method of making a longitudinal incision through the septum along the whole lower portion of the deflection, after which the lower edge of the deflected part was pushed through the slit thus provided, by which means the deflected portion was brought more nearly into the central line, and divided the nostrils more equally. I have performed the Gleason operation many times. Quite a number of those among my first experiences were failures, owing largely to the fact that the Gleason operation is not suitable for every case of deflection, since in those patients pre-

senting a septum which was uniformly regular and bow-shaped if viewed in transverse section, it was always difficult and often impossible to lock the lower margin of the upper section of septum in its new position, until adhesions would have time to form that would hold it there permanently; and when held in proper position by a splint of any kind, in many instances the mucous surfaces of the opposing upper and lower portions of the septum were crowded apart to the extent that adhesion was an impossibility. However, in cases where the septum sprang from its articulation with the superior maxilla in the median line, and the deflection did not begin to show before a height of four to six millimeters above this point, and then perhaps assumed the angular variety of deflection, the conditions were ideal for the Gleason procedure and my results under such circumstances have been invariably satisfactory to both patient and myself.

Five years previously to the publication of the Gleason operation, Asch and Mayer of New York advocated the performance of what has since become familiar to all as the Asch operation. Having tried this method successfully on cases in which the Gleason operation proved a failure, I was led for a short time to employ it in all cases of deflection. However, meeting with several partial failures, and learning of similar results in the experience of others, I was ready to abandon the method until it was my privilege to witness the technic of the procedure during several operations performed by Mayer himself, at which time I was impressed with the fact that in the steps of cutting and breaking the fragments of the septum preparatory to placing it in its proper position, the originator of the operation was much more thorough than I had been, and that my failures had resulted, as I was already aware, from the fact that the cartilaginous resiliency had not been sufficiently destroyed. After thoroughly learning and more correctly applying the principles upon which Asch and Mayer depended for success in permanently straightening deflected nasal septa, my results with this procedure were usually so good as to be satisfactory to all concerned. The outcome of a series of cases was better at least, taken as a whole, than was that of any other equal number treated by any other method used for the correction of septal deflection. My failures with the Asch procedure occurred in cases that presented thickened septa at the crest of the deflection, and also in those

cases in which the deflection was high and included the perpendicular plate of the ethmoid; or if lower down, extended far back upon the bony septum. In these cases my fear of injury to the cribriform plate no doubt was responsible for imperfectly comminuting the deflected portion, and consequent failure to completely overcome the resiliency.

While therefore some of the methods of the recent past that have been in common use for the correction of septal deformities have proven in my hands a failure, others have been satisfactory provided the cases were properly selected, the operation skillfully performed and the after attention given its proper consideration. And whereas more time and patience were often required to secure such results than are necessary when employing the more modern methods, nevertheless the final outcome in properly classified cases has usually been such as to compare quite favorably with that secured by means which leave the mucous membrane intact. Some of these older operations have therefore a certain worth, and are today both trustworthy and expedient in selected cases.

PAPER:

THE TREATMENT OF PERFORATIONS OF THE NASAL SEPTUM.

M. A. GOLDSTEIN, M. D.,

ST. LOUIS.

It is an interesting observation that in this period of prolific literature on rhinology, so little attention has been directed to the question of perforations of the nasal septum and their most satisfactory disposal. The clinical picture of a nasal septum in which, through trauma, mechanical irritation, local specific lesions, or other ulcerative processes, perforations of the quadrilateral cartilage has resulted, is familiar to all of us. When such a perforation is accompanied by constant incrustations, and often foul smelling secretions forming about the edges, it becomes a matter of considerable irritation and annoyance and often nervous anxiety to both the patient and his medical advisor. These annoying conditions can be aggravated to such an extent that they resemble in mechanical aspect the stubborn crust formations of atrophic rhinitis, and it would be superfluous to cite here the many attempts that have been made in past years to correct or overcome this *bete noir* in the treatment of atrophic rhinitis; I need only add that it has been equally as prevalent as a stumbling-block in the disposal of perforation of the septum.

Whatever the etiology of septal perforations may be, whether due to syphilis, tuberculosis, or idiopathic ulceration, constant picking of the nose, accidental or deliberate injury to the mucosa and cartilage during operative procedures on the septum, the result is nearly always the same,—a perforation, varying in size, shape and position, located in the quadrilateral cartilage, the edge thickened, and constantly crusted with partly dried and exfoliated epithelium and mucus, and in most instances showing a tendency to frequent bleeding and crusts about the entire circumference of the perforation.

If a careful inspection is made of such a perforation, it will be found, when the crusts are removed, and the parts thoroughly cleansed, that the mucosa covering the nasal cartilage has been retracted on both sides from the edge of the perforation about the greater part of its circumference, and that the cartilage projects beyond the mucosa edges.

To illustrate this point, I have dissected a perforation in the cartilage of the nasal septum of the sheep. I have empirically demonstrated the cartilage in its clinical aspect as standing out

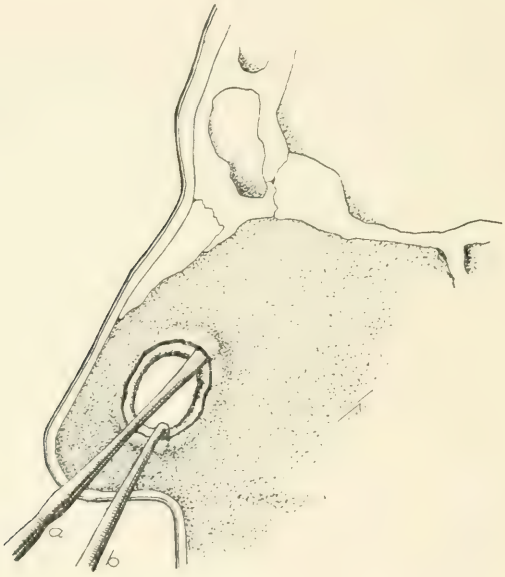


Fig. 1. Diagramatic representation of perforation showing projecting rim of cartilage with straight and bent elevators in position.

free beyond the edges of the mucosa on either side of the septum, and it is on this observation that I wish to lay especial stress. It is this feature, clinically and pathologically considered, which prevents the spontaneous healing of the edges of such a perforation. In the regeneration or reconstruction of the mucosa, nature makes the attempt to heal such edges smoothly, and whenever this can be accomplished, the patient is not troubled by the distressing crust formation, and the per-

foration requires no attention. In the majority of cases where such incrustation exists, the cause of the trouble can be found in this projecting edge of free cartilage which prevents the natural union of the opposing edges of mucous membrane.

Acting on this observation, and aided by the recent activities in the technic of submucous dissection, it occurred to me that if this free edge of cartilage which formed the circumference of such a perforation could be removed to a sufficient extent to allow the juxtaposition of the mucous membrane on either side

Fig. 2. Diagramatic representation of perforation showing the single tine swivel knife in position removing rim of denuded cartilage.

of the cartilage, a smooth union could be produced, and the cause for the ever-present and annoying crusts and scabs would thereby be removed.

In the second specimen of dissected sheep septum which I present herewith, the technic which I have devised for this purpose is illustrated. This consists of elevating the mucous membrane on both sides of the septum for a distance of about one-quarter of an inch from the free edge of the mucous mem-

brane along the whole circumference of the perforation. A rim of cartilage is then cut away from between the two mucous surfaces about the circumference of the perforation, so that the mucous membrane can be approximated without any further

Fig. 3. Freer's sharp elevator.

interference from the partition of cartilage. Union of the two mucous membranes then readily takes place, so that a stump of mucosa is formed about the free edge of the perforation throughout its circumference. There will now be no further

Fig. 4. Author's bent elevator for detaching mucosa along anterior edge of perforation.

possibility of crust formations, as the mucous membrane is smooth throughout its extent.

In my earlier cases, I have used several forms of small right-angled knives, but the technic was rather tedious and the

Fig. 5. Ballenger's single tine swivel septum knife.

edge of the cartilage was left rather irregular. This has been obviated very materially in my subsequent work by the use of the Ballenger single-tine swivel knife. I am now enabled to cut away the rim of the cartilage smoothly and equally distant from the mucosa edges along the whole circumference of

the perforation. In elevating the mucous membrane in the superior, inferior, and posterior aspects of the circumference, I use a straight, sharp Freer elevator, because of the small size and delicacy of this instrument; in dissecting the anterior part of the circumference, I use the same size elevator with the operating edge bent forward in an acute angle. The single-tine swivel knife I have found the most satisfactory instrument for cutting away the rim of cartilage. It would be a practical impossibility to use the double-tine knife for the anterior segment of the circumference of the cartilage.

The results of this operation in the series of cases where it has been undertaken have been uniformly successful, and the primary object of removing the cause of crust formation accompanying septal perforations, has been attained.

DISCUSSION.

Dr. William L. Ballenger in opening the discussion said that he would not defend the submucous resection as the operation above all others. He expected to say some things in its favor. It had been his privilege in the past to do the Asch operation a great many times, also the Gleason and the Watson, and he had also performed the Kyle operation. He had also sawed off ridges and spurs, and he had done various modifications of all the operations mentioned. At one time he used the Sajous or steel punch, but he has entirely abandoned it, as he presumed everyone else had. He said that he still found cases calling for the Asch operation. He had performed all three within the last few months. He wished to state emphatically that the old operations could still be used in quite a number of cases. In reference to submucous resection of the septum, his experience had been rather considerable during the last year and a half, in which time he had performed 117 resections, and he had used it where sometimes he could have used another operation, and he had gotten results that he felt sorry for afterwards. As to the difficulties attending the submucous resection of the septum; they had been reviewed by Dr. Beck; but the chief difficulty, according to Dr. Ballenger, with beginners would be in elevating the muco-perichondrium. Whenever difficulty attended its initial elevation, just after making the Hajek or Killian incision, he would know that he was between the mucous membrane and

the perichondrium, and it was possible to elevate it a considerable distance without tearing. If the elevation proceeded with some resistance, he advises taking a sharp elevator and lifting the mucoperichondrium from the cartilage, then to introduce a dull Hajek elevator and the balance would be readily accomplished. One should be certain he is under the perichondrium. The operation was one that could be done in a truly surgical way. The submucous resection could be performed with the nicest technic and should appeal to every one with surgical instincts. He thought also that the operation should be performed with as few instruments as possible; that five or six are always sufficient for his use. A short bladed knife is necessary to make the incision, also a sharp and a dull elevator as Hajek's. He used the Foster septum speculum, as it answers all purposes and facilitates the introduction of the swivel knife. He universally uses the swivel knife for the removal of cartilage, and for the removal of bone he resorts to the N shaped gouge, or if the bony ridge is to be fractured from the superior maxilla, he uses a modification of the Adams forceps. To do this the ridge is grasped with the forceps outside the mucous membrane, and the spine or ridge is fractured from the superior maxilla; then insert the dressing forceps between the mucous membranes, pick up the bone fragments and remove them. For removing the perpendicular plate of the ethmoid, he uses Kyle's septum saws which he has modified by making them smaller so they may be introduced between the elevated membranes; he then saws two horizontal lines and connects the posterior ends of them with Kyle's right angle saw. This quadrangular piece of bone thus sawed out can then be removed with forceps and studied. He does not believe that this method should be attempted as a universal one. As to in what class of cases the submucous operation was indicated, as against all others, he showed a little drawing of a section through the nose, the curved line in the center being the septum, and the other straight line the median line of the nose. Where there is a ridge below on the one side with a bowing of the septum in the region of the middle turbinated body. This was a common type of deviation. The lower ridge obstructs the middle meatus and the upper bowing obstructs the superior meatus on the opposite side, thus obstructing the ethmoid and sphenoid cells; hence it was essential to establish

drainage of the superior meatus as well as the lower meatus. This operation in a single sitting corrected both the lower and upper deviation. The ridge could be removed with a chisel, and the upper bowing could be quickly and readily removed with the Foster-Ballenger punch forceps, or the modified Kyle saw, so that by elevating the mucoperichondrium both of these obstructive lesions could be removed at one sitting. He said also that he had been criticised for saying that he could perform the operation in a few minutes. He didn't advise anyone doing an operation in any given length of time. When he has a simple case offering no difficulties, it takes him but a few minutes; he having actually performed a submucous resection with the removal of the bony ridge, at his clinic, in a little less than five minutes. The fact remains that the shorter the time of operation, the less shock will there be to the patient. Under no circumstances, however, should an operation be done against time. His contention was that the technique he uses saves time, and saves shock to the patient, both of which are important points. The swivel knife saves several minutes' time as compared with all other methods of removal, and required only one introduction between the mucoperichondria, whereas by other methods instruments were introduced several times. The more frequent the introduction of an instrument, the greater the liability to tear the mucosa and produce permanent perforation of the septum. The submucous resection of the septum should be the method of choice in fully 75 per cent of the cases of obstructive malformations of the septum.

Dr. Frank E. Miller said that he felt profound gratitude for the most excellent light shed upon the subject under discussion. One of the points, however, but little discussed and one that puzzled both himself and his associate, Dr. A. P. Coll, was the method of getting at an ideal local anesthesia. They had operated on one hundred and twenty-three cases by this method. They used a solution of two per cent resorcin, and four per cent cocain, to spray the nostrils, so that they can be, as it were, prepared for instrumentation without hurting or irritating the patient's nostrils. The resorcin had the effect of not only enhancing the anesthetic power of the cocain, but changed the excessively bitter and nauseous taste of the cocain, thus relieving in a large degree the psychic effect of cocain. To further remove the last named phase and to

better the patient's self-control, he administered immediately before the cocain-resorcin solution, a nerve sedative and vasomotor controller of sodium bromid, potassium bromid, ammonium bromid, each ten grains, with aromatic spirits of ammonia, one dram, which was placed in a half glass of water and taken at one dose by adults. In this way, he has had only two patients who have had collapse, and these were carried through their operation by means of bending their heads as far down and forward as possible and then massaging vigorously the nape of the neck. The anesthesia was made complete by introducing three or four strips of sterilized gauze of a size and shape to fit the cavity of the nostril when spread out upon its mucous membrane. These strips were moistened with a four per cent solution of cocain saturated sufficiently not to drop down into the pharynx and inserted with forceps having parallel blades and handles at right angles, and then smoothed out over the entire membrane with necessary force and pressure. In ten to fifteen minutes these pieces of gauze can be removed and a very excellent local anesthesia will have been obtained. Sometimes it is very necessary to prolong these operations which usually take about thirty minutes to an hour and even longer. This can be perfectly accomplished without hemorrhages, even by dipping a probe bound securely about with small pieces of cotton into a one to one thousand adrenalin chlorid solution. This is then rubbed over a few cocain crystals conveniently placed in a small glass vessel and then applied to the membrane the moment sensation begins to return or oozing occurs. By this means he had taken out without hemorrhage and without sinking in of the nose or any observable damage, the entire nasal septum within one quarter inch of its entire periphery and had saved most all of the mucous membrane. He adds that in the last three cases he had been able to so successfully apply the adrenalin cocain mentioned and that he could commence almost any submucous resection of the septum within three minutes and carry it on as long as may be required without pain or hemorrhage and without other help. All of his operations have been performed with, first, the angular knife to cut thoroughly through the perichondrium; second, the plain blunt elevator to strip it up, being careful to get through the perichondrium; third, a sharp elevator to cut either through septum or any projection on the septum;

fourth, a strong sharp curette to scrape away bony or cartilaginous septum; fifth, a broad knife with sharp broad point to facilitate cutting out and through the septum; sixth, a McCoy bone forceps for the removal of pieces of septum. This has the advantage when in position of allowing one to see just how much he is removing. He tries to avoid injuring the anterior ethmoidal artery, from the wounding of which he has had two almost fatal hemorrhages.

In closing he would state that it is the operation of all others for the correction of deviated septa and believes it will relegate the old but praiseworthy Asch and Watson-Gleason operation to a comparatively infrequent performance, and consequently supersede all other operations on the septum.

Dr. Bane had not made use of the saws recommended by Dr. Ballenger for cutting out deflected bone. It seems to him better progress can be made with the bone punch, with less danger of wounding the perichondrium. For elevating the perichondrium, he prefers to use what is known as the dentist's wax spatula No. 6. It is slightly curved at each end, and can be passed over a deflection easier than the Hajek elevator. By dulling one end, leaving the other semi-sharp, the operator has a neat double-ended elevator. After removing what appears to be all the deflecting portions, and before closing the wound, it is desirable to move the speculum from between the perichondrial surfaces, to the side where the deflection existed, in order to make sure that the passage is free. The operation for old perforations of septum, described by Dr. Goldstein, is an ingenious one. Last year Dr. DeVilbiss, of Toledo, Ohio, mentioned in my hearing, that he was doing just such an operation on old perforations.

Dr. Charles W. Richardson said there were some points that had not been touched upon, and he thought consideration of them might be of service. There was a question as to which form of operation had been the most satisfactory. A good many had obtained excellent results from the old methods and, therefore, felt loath to give them up and adapt themselves to new technic, the results of which were problematic to them. In his work previous to the submucous operation, he had obtained a great many satisfactory nasal cavities, and he finds that nothing more could be gained by doing any other operation. There were no points of contact and no crusting or further inconvenience, and a perfect sep-

tum, that is, a septum containing all its anatomical integrity. When he began the submucous work, whenever he had a case to operate at the hospital, his assistants prevailed upon him to do the old operation, and they did this so often he became ashamed of his lack of courage. Whenever he would look into the nasal chamber, and everything was in readiness, he would invariably lose courage and allow his assistants to prevail upon him to do the cutting operation. He, however, fortified himself with a number of cases in which he had done the work under local anesthesia at his office. He has now won over his assistants and resorts almost entirely to the submucous operation. Regarding this operation; he had, from a long course of work in the old operation, accustomed himself to depend upon his finger for exploring purposes, in the nasal chamber. He could in that way tell the character of the deflection and the main points with regard to its surface, etc. It occurred to him that when he had a strong angular deflection of the septum in the cartilaginous portion, that he might save himself much trouble and prevent perforation by attempting to straighten the deflection with his finger before resorting to the raising of the mucosa. In one case he could hardly force over the deflection on account of its close approximation to the outer wall of the nasal cavity. He, however, was able to press it back with the use of considerable force, and on looking into the nasal chamber found he had a space of ⅛ to ¼ of an inch between the outer wall and the septum. He also found that when he started to separate the mucosa and perichondrium, he was able to proceed easily and freely, and he had the satisfaction of having a rounded edge instead of a sharp acute angle, and the separators went over it very freely and smoothly. He never had a case that separated with such great facility. Since then he has found it of value to first force over the septum and getting it as nearly straight as possible to begin the operation. The angles stay round over a sufficient length of time to allow separating the perichondrium and periosteum and to also have a rounded surface instead of an angular one to pass over. Another point, referred to by Dr. Beck, regarding the want of ability to cause the separated mucoperichondrial surfaces to come down nicely. When the packing is introduced in these cases there is danger of forcibly separating the flaps along the anterior lip of the wound. He has found that

if the flaps are brought together and then held in a position by a very narrow spatula, and the surface along the line of incision be painted with collodion; it adheres perfectly, and no further trouble is experienced. Then introduce a Killian speculum and put in the packing if you wish and withdraw the forceps when the packing is well in. He has operated exclusively upon his last few cases under general anesthesia. Some operate under local anethesia and have their patients go through it nicely without pain or shock or psychical disturbances. He thought that the people of Washington were either of an intense psychical character or they lacked in courage; or that he was incapable of getting sufficient anesthesia to deaden the whole mucous surface. He had with local anesthesia four perforations. Three were due to the fact that the patients grew anxious, and on account of their excitement the speaker thought that he was unmercifully hurting them; this caused him to hurry and that induced perforation. After these experiences he has resorted to the operation under general anesthesia. After the patient is under the anesthetic, they are lifted to a semi-recumbent posture with a sandbag under the head, thus throwing the face slightly forward. The operation is then done with a feeling that one is working on a block. One is not anxious and one knows he is not inducing pain, and hurrying is, therefore, out of the question. The psychical disturbances he thought were due to the toxic effect of cocain, and he was sure that this operation could be done with much greater satisfaction under general anesthesia. The patient the next day does not feel knocked out as he does when the operation is done under local anesthesia. Regarding removal of the osseous portion of the septum; he had heard no one speak of the Killian forceps for the removal of the cartilaginous or osseous portion. He has found this to be the best instrument having a narrow blade and being almost out of one's line of vision while extracting.

Dr. Kaspar Pischel said anyone who had ever had the misfortune of losing a patient during or after a general anesthetic does not think so lightly of the danger of general anesthesia. According to a paper read at the Portland meeting of the A. M. A. by Doctors Arthur D. Bevan and Henry B. Favill of Chicago (*Jour. A. M. A.*, Sept. 2, 1905, page 690), the number of patients dying from the effects of general an-

esthesia several days later is probably greater than the fatalities during the operation. He, therefore, considered it a serious matter especially in a long operation. He would suggest the use of subcutaneous injections of ¼ grain morphin half hour before the operation, thus quieting the patient and lessening the quantity of cocain to be administered, and obviating the soreness after the effect of cocain has passed off. He further recommended his collodion dressing to cover the wound effectively against infection and to prevent secondary hemorrhages.

Dr. Derrick T. Vail mentioned a procedure he had found of considerable advantage in the performance of this operation where the osseous part of the septum was deflected. In the case in which he had found it particularly advantageous the barbarous galvano-cautery used years before had caused adhesions amounting nearly to atresia, and he had to perform the operation of submucous resection, separate the adhesions, and replace the osseous part of the septum to the median line. He felt that the operation of removing the bony septum was too heroic. He first endeavored to pass the Killian bivalve forceps and did so, but the instrument was not sufficiently strong to force the osseous part of the septum back in line. He then tried a forceps devised in Kyle's clinic, which is fashioned somewhat after the style of a glove stretcher. He passed the blades forcibly through the narrow side and by using gentle and positive grip, he could hear the septum crack. He was thus able to force it back nicely, and it remained giving a beautiful result. The result was so ideal that he has since used it in two other cases with satisfactory results. He regards the tearing out of the bony structures somewhat heroic and, in the light of his experience, rather unjustifiable.

Dr. H. W. Loeb said that if anyone opposed the operation of submucous resection he would be going backward, for from the results and elegance of surgical technic, there was absolutely nothing that could surpass it in operating upon the septum. It should be remembered, however, that one has to deal with a much more serious affair than in the other operations. One has to do with a wounded surface that extends for a large distance, and on account of the extent of the opposed mucosa exposed there is furnished an ideal spot for the development of bacteria. One must be rigidly aseptic.

In doing this operation, it must not be forgotten to inform the patients that this operation is a procedure with a more serious outlook than in other operations. In old people where the deflection has lasted a long time, a simpler operation is more advisable. As to the young, no one knows how they are going to grow and what will happen and it should be borne in mind. He thought he had had more perforations than any of those who had already spoken, but he had fewer now than when he began, and ascribed that fact to better technic. He thought everyone should be congratulated on the fact that a real surgical operation had been presented simplified by these methods.

Dr. M. A. Goldstein had found one case where he was unable to elevate the mucous perichondrium. It was thin and there had been a long standing inflammation and he was infirm and this method had to be abandoned. This condition will occur and may be due to previous cicatrization or former inflammation, and it will make impossible the complete carrying out of this technic. A ridge or deflection may produce it, and we are fortunate in having an old method to fall back upon. Another such condition is where a large and decided ridge occurs with a thickening in the ridge. This may be helped by forcibly bending over the septum from the deflected side with the finger, and in that way facilitating the elevation of the perichondrium from the cartilage. There will be difficulty experienced in bending it over smoothly, and when the most prominent part of the deflection is reached, it will be hard to loosen up the mucosa. That difficulty has been met by Dr. Beck by using a thin strip of tape and packing it beneath the mucosa, and gradually crowding the packing so it finds its way to the posterior septum, and thus mechanically elevates what one cannot get at with an instrument.

Dr. Robert Levy said that no one could accuse him of being overenthusiastic in regard to this operation, but as we have heard several speakers make the statement that the Asch and Gleason operations had still their uses, he wished to hear in what particular class of cases they were superior or even equal to submucous resection. The doctor has yet to find a case in which the Gleason or Asch operation was indicated, in which the submucous operation would not prove a better procedure.

Dr. Joseph Beck said that he believed that every point had been brought out; but there were some who differed. As to the anesthetic, in cases he had reported 10 were performed under general anesthesia. He always gives neurotics or children a general anesthetic. In most of the cases he was bothered by the fact that the anesthetic cannot be given properly, as the patient is not asleep on account of getting too much air. As to Dr. Pischel's objection, all must take that chance. In one case scopolamin morphin was used according to the suggestion of Ries in Chicago, and in nearly 100 cases Ries used it subcutaneously three hours before the operation. It was admirable in cases with cardiac complications. As to what Dr. Loeb said, the reaction was less in a submucous than in the other operations. If the method as suggested by the speaker in his paper is practiced, that of dissecting the mucous membrane from the cartilage by blunt dissection, the work is very satisfactory. Regarding shock, hot coffee is always at hand, that being the quickest way of resuscitating cocain shock. He had not used collodion, but would in his next case.

Dr. E. W. Day desired to warn the society against the use of scopolamin morphin. He had tried it upon three patients, two of whom almost died of total collapse. The respiration was shallow, heart feeble, pulse 60 and the patient in a cold, clammy sweat.

Dr. J. F. Barnhill repeated what he had said before reading his paper, namely, that he did not advocate the use of the older methods exclusively, nor did he wish to stand for the condemnation of the recent operations as advocated by Ballenger and Freer. He was pleased to note the difference in the arguments advanced here, as compared with those advanced at the Boston meeting a week ago. The men who argued so earnestly and so exclusively for the submucous operation at Boston were mostly young men who had probably had little experience with the operations of Mayer and Asch. Those who read the paper would suppose him decidedly not in favor of newer methods.. Such, however, he wished it understood, was not the case. The discussion seemed to have wandered from that indicated by the titles of the papers, whereas the speaker adhered closely to it. He was careful to state in each instance concerning each operation that the cases must be selected for the particular operation

performed, and that in many cases the time required for healing was longer than is now required under similar circumstances when the newer operations are performed. He thought it was not right or just to these truly great men who were leaders in rhinology, men like Asch, Mayer, Gleason, and others to cast aside their operations as wholly worthless. They were longer and often more tedious, but the results obtained would compare favorably with such results as are obtained with the more modern operations. At Boston he had felt it unjust that arguments should go broadcast in the Journal of the American Medical Association, to be read by young men, without their hearing from Dr. Emil Mayer, who was present, and when called upon Dr. Mayer said: "In many instances in which I formerly believed that the Asch-Mayer operation was the only one to be performed, I now believe that the newer method by means of submucous resection are more successful, and are to be advocated." Dr. Levy asked in what respects the Gleason or Asch operation was superior to submucous resection. The speaker did not think it superior in any case, but it could often be performed easily and successfully in selected cases, and he should certainly not hesitate with the knowledge he had to perform the Gleason operation in any case for which it is suited. He asked the question, "Why do we operate upon the septum?" Simply to restore the function of the nostrils. Any operation which will accomplish this the most easily, and allow of healing in the shortest time, is, therefore, the best operation. There was a tendency strongly shown at the recent meeting in Boston to remove an unnecessary amount of the septum, and a large number of those removed by several operators were there exhibited. In many of the cases it seemed to the speaker an unnecessarily large amount of the cartilage and the bone of the septum had been removed, and he therefore thought a warning should be sounded against the apparent recklessness with which the septum is now attacked by many.

PAPER:

AN ORIGINAL RESEARCH ON THE CAUSE OF VOCAL NODULES.

By F. E. Miller, M. D.

I desire to call attention to an entirely new theory of the formation of vocal nodules, based upon the personal observation of 234 cases occurring in my private practice. The facts herein mentioned are the results of further patient and persistent investigation of this subject, especially in consequence of many letters received from physicians and voice specialists, who have read my article on the same subject in the November, 1903, number of the *Laryngoscope,* and have requested further explanation of the cause of vocal nodules. With this object in view, I have had five original and very careful dissections of larynges made by Dr. Edgar E. Stewart and Mr. and Mrs. H. Howard Brown, voice anatomists of large experience, to whose skillful work under my direction this discovery is mainly due.

Summary. Of 234 cases of vocal nodules coming under my observation during the last fifteen years, 136 were found upon the left cord, 98 were on the right vocal cord. 32 were bilateral and symmetrical vocal nodules, that is to say, on the left side and right side at "C" sharp, that is at the anterior third of the cord, the most common place for nodules, two single nodules and two bilateral and symmetrical at "F" sharp in company with double bilateral "C" sharp nodules. The "F" sharp nodules were situated about half way between the thyroid end and the anterior third of the cord: One at "G" sharp, the remainder at "C" sharp. There was one "B" flat nodule on the left vocal cord and this was in company with a bilateral symmetrical "C" sharp nodule. This makes it very evident that these nodules occur at as many as four different points on the vocal cords, although the records of some investigators of this subject seem to allow for one only, and that always occurring at about the same point.

Before stating my theory of the origin of these nodules, I shall give the results of different kinds of treatment employed by me for their eradication. Prior to the year of 1902, I employed the ordinary medical means familiar to all. I found that such treatment was attendant with more or less indifferent success. Having been a public singer of recognized standing for a number of years, the pursuit of this subject was of especial interest to me, and while recognizing the fact that all nodules known upon the vocal cords did not occur in singers' throats, the systematic recurrence of nodules at specific points on the vocal cords, long ago led me to believe that the manner of voice use had something to do with this phenomenon.

During the year 1902 I met Mr. and Mrs. H. Howard Brown, the voice specialists whom I have already mentioned. They demonstrated to me a theory of voice action and a system of training which seemed to me to have a definiteness not present in the empirical system with which I have been familiar before. They assured me that in such cases of singers' nodules and vocal paralysis as I might have among my patients, there would be present certain vocal derangements, which, when removed, would better these conditions. Experimenting upon this, I sent them a number of people and the rapidity and certainty with which nodules and paralytic conditions disappeared were to me remarkable.

I herewith state the result of a few cases which were cured in this way.

Miss L. J. T., soprano with all the natural attributes for a magnificent singer: Voice out of commission. Double nodules cured in fourteen lessons. Reports made to me showed chin muscles much over-contracted, tongue badly depressed and tone consequently pinched. Remained with these teachers for some time and is now doing concert work, occupying position as dramatic soprano soloist in Temple Emanuel, one of the largest congregations in New York.

Miss E. P., soprano. Double nodules, tongue depressed, jaw pulled out of place, tone pinched, cured in thirteen lessons. Remained for one year, now in Berlin studying for grand opera with G. B. Lamperti.

Mrs. M. D., soprano in grand opera. Chin muscles over-contracted, voice pinched in high tones, nodule began to disappear in two lessons. Took ten lessons in all and returned

to opera singing. Assured us two years after that she had had no further trouble.

Miss G. R., principal soprano in Savage Grand Opera Co. Chin muscles over-contracted and tongue depressed, voice forced in high tones. Nodule on cord for four months, break in voice at "F" sharp. Nine lessons, without interfering with daily rehearsal; during the last part she sang four roles in one week. Voice then perfectly clear. The nodule was cured after the seventh lesson.

Mrs. J. T. O., soprano. Chin muscles over-contracted, voice totally paralyzed for singing effort. Fifteen lessons, sang concert in Providence, R. I., receiving good press notices.

Mr. E. W., noted concert tenor. Interarytenoid swelling for three years, tone husky, palate relaxed. Forty-seven lessons, great success in England. After a recent concert in Nashville, Tenn., paper styled him "The greatest tenor, by far, who has ever sung in Tennessee." Laryngeal condition perfect and tones perfectly clear.

In all of the above cases, in addition to vocal means, they used some Swedish massage movements on contracted chin muscles, believing that much good was accomplished by this means during the first stages of treatment. These movements aid in cure by relieving some of the worst muscular contraction and by stimulating circulation and nerve supply.

The general result of treatment of all these cases corresponds with the instances quoted above.

In the year 1903, I purchased an apparatus which, as used by me, has proven the sovereign remedy for nodes. This instrument completely supersedes the mechanical work above mentioned, and has more value in that it is an anesthetic and produces powerful desensitizing effects upon the mucous membranes, that border upon the marvelous. We know that a powerful blow behind the ear, upon the chest, back of the ear, or in the epigastrium, namely, over the principal vaso-motor ganglia, will shock the subject to which the blow is given, causing an anesthesia of that part, and a blanching of the mucous membrane within the nose and mouth similar to that produced by a sudden most serious hemorrhage. With an instrument which consists of a rubber cap screwed into a Swedish massage bulb fastened to a Vosberg's cable and a rapid motor operating this cable, anywhere from 1800 to 3000 revo-

lutions can be administered to the human body in the shape of blows accompanied by oscillation and suction.

By placing this instrument at a speed of 3000 revolutions per minute back of the ear and drawing it in the position of the stylo-pharyngeus from its mastoid attachment to the thyroid, then over the sterno-hyoid and sterno-thyroid, thence over the four layers of chin muscles, thence over the angles of the neck, then again from the occiput down along the spine along the vertical column to the os sacrum (the whole process not taking over two minutes), there will have been produced in the mucous membrane of the nose and throat most remarkable phenomena. A pallor will have spread all through the nares, posterior and interior, over the pharynx and into the larynx and particularly will mark the region of the epiglottis and larynx. Vocal cords with nodes upon them which are red and bulging and covered with mucus, will seem to be several shades paler. The cords themselves will be less bowed and the node will become surprisingly smaller and apparently absorbed to a great degree.

I know of no means that produces such quick and remarkable effects upon the mucous membranes of the vocal cords or upon these various parts mentioned above; so remarkable is this, that nodes, if quite acute, not too large and deeply infiltrated, will be absorbed in from three to five days. Of course, by singing again they are apt to recur, especially if the false mechanism is indulged in, or the reflex conditions established by the node-producing element have not been eradicated.

Observation, therefore, and recent experiments, lead me to believe that if these nodules of singers are to be permanently cured, the means of a correct vocal action must be resorted to in the majority of cases. Many people, not singers, produce nodes by coughing. I have seen a dog with nodes. But the nodes of singers which have caused so much discussion have been referred to by Prof. Turck, who first illustrated and called the attention of the profession to chorditis tuberosa acuta. Dr. Jas. P. MacAvoy, of this city, in his reminiscences of Prof. Schnitzler, of Vienna, says that he was accustomed to say to his post-graduate class of students from all parts of the world, "A guinea to the one that makes a correct diagnosis!" Although Dr. MacAvoy lived with Bergasse, Prof. Schnitzler's first assistant, for three years, he never saw the guinea carried away; he never saw a student able to make the diagnosis of a singer's

nodule or the acute chorditis of singers. It is no wonder then, that its diagnosis and etiology have been questioned.

The purpose of this article is to throw any additional light possible upon work which has already been done, and if issue is taken with any statements made by other voice specialists, it is for the purpose of furthering investigation by causing discussion of any points at issue, and in order that eventually we may arrive at the truth. That there must be cogent reasons for the affinity of the vocal nodule for certain portions of the cords, is certainly recognized by the most competent laryngologists, who have advanced many theories as to their cause, most of them mysteriously seductive, but not any of them definite enough to satisfy careful analysis.

In explaining this latest theory, it is necessary to understand something of voice action, and before stating my theory, and before giving the result of a microscopic examination of double nodes, which I removed from vocal cords, I will give a brief explanation of what I believe to be the correct standard for tone production. The fundamental movement consists of breath pressure. This production is caused by two movements, inspiratory and expiratory: The inspiratory movement consisting of exertion of the rib raising and expanding muscles, and contraction of the diaphragm. The expiratory movement consists of contraction of the abdominal and back muscles, which pull the ribs inward and downward. It is unnecessary for me to go into details any further than to say that it requires skillful work to establish a balance between the exertion of the expiratory movement, and the letting go of the inspiratory effort. The index of this breath control and pressure can be felt below the base of the breast bone, where it seems as though on contraction the rectus abdominis muscle bunches itself, giving apparently a forward movement. It has been known for a long time that in singing the scale of pitches, the thyroid cartilage tilts forward and the vocal cords are lengthened. We will designate this action as "cord stretching" for the purpose of lengthening and thinning the vocal cords as the scale ascends. This tilting is accomplished by means of the palato-pharyngei muscles which fasten to the upper back border of the thyroid cartilage, and on contraction pull towards their fixed end on the hard palate.

Attaching to the under side of the hyoid bone and on contraction pulling towards their fixed end at the top of the

breast bone, we have the sterno-hyoid muscles. The first of these pulls somewhat upward and forward at the back of the larynx, and the second pulls downward on the front of the larynx, causing a forward tilting of the thyroid cartilage. The vocal cords are fastened in the angle of the thyroid cartilage at their anterior ends and at their posterior ends to the arytenoid cartilage. It must be remembered that the arytenoid cartilages are attached to the cricoid cartilage, and do not move excepting to approximate the cords. In order that the larynx may have a fixed point upon which this tilting can take place, it is provided that the stylo-pharyngei muscles, fastening on the upper back edge of the thyroid cartilage and upon contraction pulling towards their fixed end at the styloid process, and the sterno-thyroid pulling from the side of the thyroid cartilage to the breast bone, combine to hold the larynx in place. I have watched the results of vocal work based upon this action, and have found them thoroughly satisfactory.

I herewith give microscopic examination of double nodes. The epithelial layer manifests no deviation from the normal, either in its external hornified stratum (which is very thin) or in its relation to the subepithelial connective tissue, in any portion of the sections examined. Except in one or two very small segments, the thickness is almost uniform throughout. Even with strong magnification (x460), not the slightest evidence of separation from the subepithelial layer can be noted. At a point corresponding to the apex of the nodule, there is a flask-shaped invagination, or crypt-like depression, about one-fifth the size of the total mass. This invagination begins as a tubular inversion which gradually enlarges to bulbous shape in the depth. In some of the sections this sacculation appears as an almost spherical closed cavity, which phenomenon, no doubt, is due to section above or below the level of the outlet to the epithelial surface. It could not be determined whether or not this was an artifact due to shrinkage in hardening of the tissue.

The connective tissue composing the bulk of the nodule is densest immediately beneath the epithelial layer, and gradually becomes more and more rarified as the base or attachment to the cord is approached. Throughout these portions the spaces formed by separation of the connective tissue fibres are infiltrated with a greater or less amount of homogeneous or very finely granular translucent substances, in every way resembling coagulated edematous (serous) fluid. Near the base or cord

attachment, the tissues are so loosely arranged that the fibrous fibrillae form a fine reticulum, the spaces of which are infiltrated with the translucent, homogeneous or firmly granular material. Here the tissue cells have assumed a marked stellate shape with decided prolongations, which anastomose with fibrillae from other cells of like nature to form this reticulum. This appearance is unquestionably due to edematous infiltration of a passive and very probably a chronic nature, since there is nowhere any evidence of cellular proliferation, except in the intima of the smallest vessels, which show a moderate degree of nuclear activity, but not sufficient to markedly encroach upon the lumina. No red blood corpuscles and but rarely a polynucleated leucocyte (wandering cell) were noted outside of the blood vessels.

Except for a slightly thicker horny layer of the epithelial covering, the nodule lowermost upon the pin presents the same histologic features.

Conclusions drawn from careful microscopic examinations made by Drs. Henry T. Brooks of the Post-Graduate School of Medicine, and John Larkin of the College of Physicians and Surgeons of New York, made especially for this article, show that in its simplest form the nodule is a superficial edema, manifesting itself on the edge of the vocal cord, sometimes appearing on one and then on the other, and at times on both, making symmetrical and bilateral nodules, dependent entirely on causation. For instance, the cause might be a simple case of coughing, and to simplify matters pathologically the nodule is an edema, a swelling from effusion of watery fluid in the cellular tissues beneath. If aggravated by continued use of the voice, it may develop and become exceedingly dangerous to the voice by extending outward to the tissues of the cord itself. The cure for this state of thing is by absorption of the fluid contents and a consequent diminution of the size of the nodule, until finally the condition of the cord becomes normal and the voice is fully restored. In the formation of the nodule, it is worth remarking that the traumatic or coughing nodule may appear at any point of the cord. It shows at first at one point and then at another. The nodule caused by vocal weakness, however, displays an exasperating, even puzzling affinity for particular portions of the vocal cords. It is generally found protruding from the anterior and middle third on one or the other side of the glottic opening. In fact, it frequently hap-

pens that the traumatic nodule and what for convenience's sake has been arbitrarily styled the "vocal node," are simultaneously present, the traumatic nodule existing by itself in some irregular portion of the cord or superimposed upon, or blended with the vocal node, each to be distinguished by its well defined location, although produced by totally different causes.

Those who would explain this by the theory of attrition or segmentation, would refer you to the stroboscope of Oertel, or possibly to the more or less familiar trick of the vibrating string and the bit of paper. If the paper be laid upon the string at a certain point it will be flirted away, while if it be laid upon the string at another point, the rest point, if you please, it will slip unagitated to the floor. Inasmuch as the vocal cords are subject to the same laws, the lesson drawn from the string and the bit of paper applies, the nodule taking the place of the paper. Note, however, the difference. The string is single and there is no attrition. If there were two strings, the bit of paper might be caught and sadly twisted in a miniature whirlwind of opposing vibrations, and a node produced symmetrically on its mate, the opposite cord.

By studying the laws of vibration of strings and pipes in physics, we find that there are sections of the vibrating string and portions of the air in the organ pipes which do not vibrate with the string or pipe as a whole, but which, as nodes and segments, subdivide the string and pipe into active and passive portions.

By careful observation we are able to see whether the vocal cords are making a segment in the center or whether they are vibrating longitudinally without making a segment with the opposite one by vibration. Dr. Curtis says: "As a matter of fact, the tiny pearls of mucus are driven by the centrifugal force of the vibrating vocal cords to the middle point of the vibrating segment and from thence are thrown outward. They mark, then, if anything, points of greatest movement in the vibrating segment, and not points of rest." Again, "This observation confirms the theory advanced several years ago by me as to the formation of nodules of attrition in singers' cords, and explains the removal of the same by exercises of vocalization."

There are those who define a "singer's nodule" as an inflammatory growth situated at the junction of the anterior and

middle thirds of the vocal cords, a definition which is certainly most unsatisfactory when we know for a fact that nodes occur between the middle of the anterior third and at the posterior third, and also on both cords as well as at the junction of the anterior and middle thirds. It has also been said that these growths are due to the employment of an injurious method of attacking tones, and are to be eliminated by using a "focus" of tone a (a term certainly very hard to understand). This "focus" of tone places the initial impulse upon the cords in such a manner that attrition becomes impossible. I take issue with this statement because I believe that attrition is not necessary to form the nodule, as will be seen when I state my theory. It may be after these growths have been started they may be enlarged by attrition.

The defenders of the segmentation theory (portions of the vocal cord being divided into parts), state that the damage to the singing voice occurs in the upper medium register. What is meant by this is probably the upper half of the middle register, relatively high or low according to the voice, whether it be soprano, contralto, tenor or bass. It is also said that this segmentation is rearranged for higher pitches in such a manner that the vocal cords do not rub against one another. On the theory of the specific action of the thyro-arytenoideus externus muscle that I now propose, this rather mysterious statement is unnecessary. I also take issue with the following statement: "That singers' nodules are the result of a direct mechanical effect caused by the interference of opposite vibrating segments, and are not true nodes in an acoustic sense has been proven beyond doubt by the investigation with the stroboscope of Oertel, Koschlakoff and Simanowski." Of course we all have our own opinion, and having made some investigation, we think that this is not proven beyond a doubt, and we do not believe that it can be so for the one grand reason that it is impossible to make proper observation with an instrument which employs a human subject whose cords are to be seen; again the eye and hand of the operator, and still further an instrument whose revolutions are too rapid for the human eye to make correct observation; and then again in all of these observations we can see only the one side of the cord, that being the upper side.

My theory on the causation of singers' nodes is as follows:

A great majority of the subjects present a follicular ton-

sillitis. Accompanying this there is more or less congestion of the mucous membrane in the larynx. This renders that portion over the vocal cords more liable to become edematous. It is further thought that there is a hyperactivity of certain fasciculi of the thyroarytenoideus externus muscle, and that where these bundles cross the true cords there is produced a localized edema or singer's node.

By a remarkable combination of circumstances, it has been my privilege to have under my professional care all four of the leading solo soprano voices of Old Trinity, St. George's Church, Heavenly Rest and St. Thomas'. These boys have all begun their changes in voice under identically the same conditions. The boys I refer to are Earl Gulick, Allen Schnebbe, Charles Mehan and Maxwell Kennedy, well-known boy sopranos, who have sung all over the country. The observation consisted of this: First, that it was the inflammation of the left tonsil, then a partial paralysis of the left cord, then the production of a node on the same cord at "C" sharp, followed by the production of another node upon the other cord. In the left tonsil of each one of these cases was found chronic follicular tonsillitis as determined by the usual signs of this disease, one of which was the ability of the affected tonsil to express large cheesy plugs. In all these cases, beyond a slight inflammation of the anterior and posterior pillars, there seemed to be nothing else to be observed about the tonsil. All of these little patients did not come to me for sore throat, or because they were afflicted with tonsillitis, but to consult me on their vocal debility and the loss of their singing voice.

One of them in particular went away with diagnosis of cheesy deposits in the left tonsil and partial paralysis of the right cord, with my request that he should not sing owing to an impending change in his voice. I did not treat this boy at all, did not even spray his throat because I saw the nature of his voice failure. I merely expressed a few of the cheesy deposits out of the tonsil crypts with the result that at that service he sang well. He returned to me, however, with a node in his vocal cord produced in his attempt to sing "A" at this service. Going from the medium "E" to the high "A" he felt a sudden giving away of his voice, although he was able to hold the note almost to its end. The following Sunday he was unable to sing, and although the boy returned

to me during the week, I did no more to his voice than to tell him that I thought the change had begun. On the next Sunday his voice failed completely, so much so that the very remarkable statement was made by one of his musical friends to the effect that, while the first spraying of his throat had resulted in a decided relief from all his vocal debility and had put it in good order, the second spraying had brought about a condition that had ruined his voice. Subsequently, at his father's suggestion, the boy resigned his position. In reality I had not used the spray at all, and did not treat him the second time. Since that time he has not sung at all, his voice having descended an octave without treatment, except for the treatment of the ear on the same side with the inflamed tonsil, and which has been affected a long time in consequence of the diseased tonsils through the auricular branch of the vidian. Undoubtedly, this had also affected the nerve supply of the ear and had created certain catarrhal disturbances affecting that ear seriously. As a result his voice has completely changed and is now in that broken condition that usually follows the change of boys' voices always noted at puberty. The node, however, has entirely disappeared and so has the paralysis of the cord, while in singing the usual phenomenon takes place, although he is now 14 years of age. Should he sing from "A" flat down to "C", his voice would immediately break at "C" sharp and jump a fifth, that is, to the "G" sharp below, either going into the man's voice or giving out entirely. Now in singing his voice jumps the entire octave from "C" sharp down to the lower "C" sharp on almost every occasion, and, strange as it may seem, all of these boys have had exactly the same phenomena.

If we turn to the thyroarytenoideus externus muscle, we will see that its action is somewhat complicated on account of its attachments.

A brief description of the anatomic conditions existing in this portion of the human larynx would seem appropriate here. The thyroarytenoideus internus extends horizontally backwards from the inner surface of the thyroid cartilage in front, near the median line, to the muscular process of the arytenoid cartilage behind on either side, and forms the inferior or true vocal cords. Externally or laterally, but still within the confines of the thyroid cartilage, this muscle is overlapped by the thyroarytenoideus externus or wall muscle, whose fibres run

almost vertically upward from the anterior inferior part of the inner surface of each ala of the thyroid cartilage, from its lower border in front, and also from the anterolateral portion of the inner aspect of the cricothyroid membrane to spread out in the mucous membrane of the larynx above, and is inserted in part into the edge of the epiglottis. Thus it will be seen that these muscles cross nearly at right angles, somewhat in the manner represented in the diagram. It is just at the site of contact of these two muscles on the mucous membrane where the vocal nodes occur. From Luschka's drawing, it will be seen that there are practically three divisions of this muscle: the arytenoid division which unites with the cricoid, the thyroid division, and the epiglottic division. The action of this muscle plays a most important part in the approximation of the vocal cords, and as normal intrinsic action is dependent upon normal extrinsic action, it will readily be seen that any derangement of the external action would cause a direct tendency of this thyroarytenoideus externus muscle to overact, and it is upon the combination of those tonsillar lesions and the overaction of this muscle that my theory is based.

With regard to prevention of nodes, if in childhood adenoids and tonsils receive their proper attention, if lingual tonsils and pharyngeal hypertrophies are watched with care and removed; if children are made to be very careful during the period of voice change, menstrual functions and other conditions which cause sympathetic nervous changes to take place affecting the mucous membranes at the age of puberty; if a correct synthetic voice production or voice science be established, which can be simplified and studied by proper anatomic and physiologic laws, we probably would never have the nodule question to consider except as a matter of accident.

Acting upon this theory, I have caused some dissections to be made with the inference that there must be some factor at work beneath the mucous membrane over the cords which cause a local edema and consequently the slight elevations which appear. The idea was conceived that the venous return might be cut off by the pressure of certain muscles acting in different directions and thus cause the local swelling.

Case I. Larynx of a Chinaman, aged about 45. Occupation, laundryman. Voice high pitched, larynx large. Found

thyroid fasciculus large; cricothyroid fasciculus also large, but a space between these fasciculi where the muscle was very thin. Arytenoid fasciculus broad and thin. There were no nodes on these cords. The larynx was a beautiful specimen, but the tonsils were in their normal condition.

Case II. Larynx of a negro, aged 24. Occupation, waiter. Voice gutteral, specimen large, cords lax. The anterior fasciculus was larger, broader and stronger than in the former specimen, but the cricothyroid bundle was not as distinct. The space between these fasciculi was better filled with muscular tissue. No nodes existed. Tonsils normal.

Case III. Larynx of a white girl, aged 18. Occupation, unknown. Character of voice not known. Larynx, fair size. Thyroarytenoideus externus well developed, especially its posterior portions, that is, those arising from the cricothyroid membrane and from arytenoid. No nodes present. Tonsils normal.

Case IV. Larynx of a butcher, aged 45. Specimen of medium size. Character of voice not known. In this instance the thyroarytenoideus externus was more peculiarly sloped, the lower part extending mostly from the thyroid cartilage. Was quite thick and broad for about one-half its course. The upper end, while not entirely lacking, was very poorly developed. For this muscle, there was no fasciculus more distinct than another. Pharyngeal tonsils normal. No nodes present.

Case V. Larynx of a laboring man, aged 40. Specimen of large size. Character of voice unknown. This larynx resembled the previous one in all particulars, except that the upper fibres of the thyroarytenoideus externus were more distinct.

Case VI. Male larynx, aged about 35-40. History unknown. Very large. Thyroarytenoideus well developed, especially the arytenoid fasciculus. The muscle was unusually thick where it overlapped the cord. No nodes were present. Tonsils not enlarged.

After procuring these photographs of this muscle, I recently had the following experiments made to try to produce a node:

A medium-sized dog was examined to see if he had any nodes on the vocal cords. None were found. His larynx was then operated on, using the modern surgical asepsis with the idea of producing nodes. The anterior inferior angle of

one ala of the thyroid was trephined (3-8 inch trephine) and a mattress suture taken in the thyroid fasciculus of the wall muscle. The parts were then closed. The dog was allowed to live two weeks, means being taken to cause him to bark considerably during this time. He was then chloformed, the larynx taken out and the following observations made: Skin wound healed by first intention; parts beneath in beautiful condition; muscle shortened considerably. No nodes were found.

This would hardly disprove the theory, as the tonsils were not in the typical condition observed by me.

Another experiment: A fairly good sized shepherd dog was used. In order to produce a tonsillar inflammation in the animal, a plug of debris was expressed from tonsils of two renowned singers having nodes, one male, the other female, and rubbed with considerable pressure into the mucous membrane between the pillars of the fauces while the dog was anesthetized. This was done within eight hours after removal from singers' throats. On inspecting the throat every day for a week, no change was noticed.

Several factors were supposed to account for this. First, the bacteria contained in the tonsillar plug from the human pharynx were thought to be of too low a virulence. Second, the resistance of the mucous membrane without any previous congestion was thought to be too high. Third, several errors in technic were discovered which probably played a lesser part.

These several indications were met in the following ways:

The resistance of the tonsils and mucous membrane was lowered by painting the region with cantharidal collodion while the dog was anesthetized. This produced a typical congestion and in a couple of days a young and virulent culture of pure streptococci was rubbed on the inflamed parts. No false membrane formed but a true tonsillitis developed. After a few days the dog was prepared for operation (neck shaved and all aseptic precautions taken). The skin incised in the median line, one ala of the left thyroid cartilage exposed. This was treated in the following manner: A slit-like opening was made in its lower part about 3-16 of an inch in width and almost as long as the entire width of one ala. The piece of cartilage was removed and the thyroarytenoideus externus lifted into the gap. From its central portion a piece was re-

moved consisting of the entire thickness but not completely dividing the muscle, leaving the anterior and posterior portions in the hope that nodes would be produced at the joints where these fasciculi pressed on the true cord. The vacancy in the cartilage was then packed with a gauze drain and the latter carried to the surface. The skin was sutured and a dressing 1-100 formalin was used. Convalescence was uneventful, except that it was noticed that the dog's bark had changed.

The cords were examined with a laryngoscope and a node was noticed about where the posterior fasciculus crossed the cord. The dog was shortly afterwards chloroformed and the larynx and tongue were removed. A node was observed on the posterior portion of the left cord. The larynx was then placed in a weak solution of formalin and the node became smaller. On splitting the larynx open from behind through the cricoid cartilage, the node disappeared. From this it is suggested that nodes cannot be preserved after death.

We have under way several experiments of like nature, by which we hope to prove that nodes can be produced in every case by means of infection of the tonsils and perverting the action on the thyroarytenoideus externus muscle. We hope to have the pleasure of demonstrating the successful outcome of these experiments at some future date.

In closing the discussion of this article, I desire to give credit to all of our professional brethren who have done valuable service in the treatment of singers' nodules.

We admit that our system is not the only method of cure, but we claim that if this system is followed, it will be further reaching than temporary cures, that if given a reasonable length of time, it will tend towards a great lessening of this evil with a possibility of its eradication.

By combining our efforts we, the throat specialists of the world, might become largely instrumental in helping singers and singing teachers to cast aside forever empirical methods, and accomplish the development of the only true thing, a synthetic method. Although the main purpose of this article seems to be the establishment of the origin of nodes, I should feel highly gratified if the ultimate outcome of it should be their prevention.

I, therefore, close this article and its discussion by laying especial emphasis upon the clause relating to prevention. I extend sincere thanks to those who have aided me in the preparation of this article, and to all the gentlemen here present for their courteous attention during the delivery of it.

DISCUSSION.

Dr. D. Braden Kyle, in opening the discussion, said that a singer's node was a tumor, but not a neoplasm; that there is a cellular change in every swelling; that it was an increase in bulk in tumor, in neoplasm an increase in tissue. As to the cause, his own experience clinically and in the laboratory caused him to agree with Dr. Miller in at least the majority of cases, that it was some inflammatory process. The vocal cords received their blood supply as the heart did. During activity of the cord, there is little blood supplied, but during rest it received more blood. In some sections he had made of these cases he had diagnosed areas of hemorrhagic infarction. If there is infarction there should be an area of edema. After the continued use of the voice, the cords are found with edema; this condition can be cured by rest. In the formation of the nodule there is a slight hemorrhagic area. If there is an inflamed condition of the cord or adjacent structures, one is more likely to have a node. He has observed these cases in those who use the 'phone for a continuous time for long distance. In one case where the voice was suddenly lost, it was regained by rest for ten days. If one of these nodes is broken it reduces about half, diagnosing a cellular structure. A node is liable to occur at any portion of the cord. It is due to action and to blood supply.

Dr. J. A. Stucky said that he had had a good deal to do with singers' nodes in the last few years, and in his experience the less he did with them the better for the patient. The cord requires absolute rest, and soon the node is gotten rid of. Diet in connection with rest and no local treatment is the best treatment for the average node.

Dr. G. Hudson-Makuen thought there was no question that these nodes were due to a faulty vocal technic. He thought that singers' nodes is not a good name for them, because they occur in people who do not sing, but only talk a great deal. They may also be the result of excessive cough-

ing. The best way to cure them is to remove the cause, to correct the faulty vocal technic. A man who is obliged to talk very much, over the 'phone, or elsewhere, should take the trouble to learn how to talk. He agreed with Drs. Stucky and Kyle as to the importance of rest and diet in the treatment, but these measures of themselves would not remove the condition permanently, unless perchance they could be continued indefinitely.

Dr. H. W. Loeb said that he had a case where a patient thought the proper way to sing was to use every vowel. She developed a node on both sides, and, much to her chagrin, she had to change her method, and they speedily disappeared. A good deal of research ought to be invited on this subject, as every one was, in the opinion of the speaker, still very much in doubt.

Dr. Frank E. Miller said Dr. Kyle's criticism of the statement, "That in its simplest form, the vocal nodule is a superficial edema," practically speaking, was just, but in this article just read before the Society, he was so limited for time that he reduced the entire article from twenty-three pages to twelve, in order that he might have full time for discussion.

In the unabridged article, the pathologic findings and conclusions drawn from careful microscopic examination made by Drs. Henry T. Brooks, of the Post-Graduate School of Medicine, and John Larkin, of the College of Physicians and Surgeons of New York, would be found, which explains fully the points brought up by Dr. Kyle.

Dr. Stucky has asked for demonstration of the formation of the nodule, also a more detailed explanation of how a patient is treated, as was several years ago given by Dr. Holbrook Curtis before this Society.

Dr. Miller prefaced his remarks by saying that he prized most highly the original work of Dr. Curtis on this subject; the speaker regarded Dr. Curtis as Edison in relation to the electric lamp. You know that Maxim discovered the principle of this before, but Edison made it commercial and practical to the world. Just so Dr. Curtis had brought this very interesting subject before the medical and musical professions at large, even as Edison brought the electric light before the public.

Dr. Curtis' demonstration, he said, consists in depressing the chin on the sternum, using supracostal respiration, at

the same time singing the syllable "Maw" at "C" falsetto, while plucking the lips with the finger and focusing the tone "Dans la Masque." Dr. Miller illustrated this point, but made the observation that this tone could not be amplified correctly, consequently was not a correct procedure. He offered as an explanation of this remark, that in true falsetto the larynx was raised from the fifth cervical vertebra, where the longus colli muscle divides, especially so that the larynx rests upon the spine proper, which, as anyone can readily see, allows for resonance from the spine and added leverage for amplification of tone; consequently, there was no point of control for the use of the extrinsic muscles which are so necessary, not alone for amplification, but for overtone. For instance, the palato-pharyngeus, one of the longest of the extrinsic muscles, also useful in giving the Italian resonance to tone, and one of the great producers of overtone on account of its length, is noticeably deflected from correct production of tone by singing falsetto.

The "Maw" method for curing nodes is advocated as well for correct rules of voice production, and when scrutinized carefully, it will be found to consist of the same old empirical formulas established by Maestros of long ago. Even in the last twenty years one of our famous lady teachers, Marie Bissell, has advocated the singing of "Maw" in about the same way, but not falsetto, for bringing the voice forward and obviating the so-called breaks and holes in the voice which were probably due to the results of nodes.

Dr. Miller thought that Dr. Curtis' idea could be explained on the ground that by singing falsetto, the arytenoids are so changed in their action in their facets on the cricoid, that the edges of the vocal bands have a different alignment; hence, vibration under such conditions might benefit and reduce the nodular condition of the chord, as it would no longer be irritated by the opposing chord. But he was of the opinion that the voice specialist should not use vocal exercises for inflammatory conditions, nor allow singing at all for at least ten to fourteen days, dependent, of course, upon conditions.

Dr. Stucky asked Dr. Miller to tell in a practical way how to treat these cases.

Dr. Miller replied that the chief beauty of any voice is its quality. To test this, he actually made them sing the scale of "C" for a low medium voice (male and female voices an oc-

tave apart). A medium voice, the scale of "E"; higher voices, the scale of "A" flat. The low voices will break in the vicinity of "C," and the higher voices, "C" sharp, "D," "E" and possibly "F," dependent upon the closing of the crico-thyroid niche, the lack of harmony between the extrinsic and intrinsic muscles, and other reasons which he had stated in his paper. As the patient sings these scales which he gave them from a small reed pipe, he judged the quality and noticed the break. He sat directly opposite them, and could almost invariably tell on which side the nodule was in the same manner as he could tell when stepping on his front stoop, whether the cars of any one of the three roads were running and in what direction, and oftentimes could feel in his own throat sympathetically on which side the tension was, the affected chord being opposite the one from that in which he felt the tension. In this way one has arrived, as the music teacher would, objectively and subjectively, at the cause; and has an excellent idea as to what makes the quality of the voice under examination deficient. The next step is to get at the underlying cause. He has never yet seen a node in its incipiency, but that cheesy plugs could be found in some one of the crypts of the tonsils. More than twelve cases had been sent to him by other physicians stating that this condition was not to be found, and in each case, by deep pressure on the tonsil over the anterior pillar and carrying it downward to the base of the tongue carefully, so as not to abrade the surface of the mucous membrane, he had been able to express these cheesy plugs. These tonsils are carefully relieved of these crypts by deep spraying into the crypts of the tonsils themselves, with ten per cent of solution of argyrol, which generally removes them or relieves the condition, and the patient will state that the voice is much more clear, and that they feel easier. Sometimes touching the tonsil in such a condition causes a violent reflex. The next procedure is to use the Vosburg vibrator as directed in the article, which vibrates the chord, as can be readily seen by looking at the larynx with the laryngoscope, or making them sing, then the egophony will be apparent, showing that the chords do vibrate by means of the vibrator, and that any further explanation is unnecessary. Before leaving the office they are instructed to massage the throat as follows Straight and boring movements from the tip of the thyroid cartilage to the mastoid, from the same

point on the thyroid cartilage down to the clavicle. From the same point again on the thyroid to the point of the chin. This is kept up for ten minutes, morning and night. The solution to be rubbed in contains one-half drachm of salicylate of methyl to an ounce of white vaseline and lanoline, equal parts. It so happens that we often have an acute inflammatory condition involving nares, pharynx, tonsils and bronchial tubes with this condition; then he sprays them thoroughly by means of an inhaler, preferably a Sass inhaler, four or five long inhalations with a mixture of iodoform 20 grains, and ether, one ounce. This has the effect, on being inhaled, of covering the entire mucous membrane with a fine layer of iodoform, and seems to invade the entire respiratory tract. This caution must be observed, that a lady can scarcely stand more than three such inhalations, and a full-fledged man more than five, and they must be made to lie down immediately after taking it for ten minutes. By this means, startling effects are produced in all the membranes affected, especially upon the node if inflamed or edematous. If this condition is at all accompanied by coughing, he gives a mixture containing spirits of chloroform, spirits of camphor, of each, one drachm, iodine, one grain, syrup of tolu, one-half ounce, spearmint water enough to make three ounces. Two teaspoonfuls every hour until relieved. Another point about the ether and iodoform mixture is that it must not be used over three times the first day and not over two days in succession, and should always be freshly made. It has a tendency to thicken up the mucous membrane and mats down the ciliary bodies of the bronchial tubes.

When the tonsils remain seriously affected by more deep-seated conditions than first mentioned, combined with malarial or rheumatic affections, appropriate treatment is given, sometimes even the removal of the tonsil. This he has a decided disinclination to do, not because it will do any harm or affect the quality of the voice, but because he had known it to produce a psychological voice failure that was astounding, although time has shown the operation to be of wonderful benefit in every way to the voice.

One other suggestion Dr. Miller would like to make in regard to these acute conditions just described, is that for one or two treatments, not more, the whole respiratory tract be sprayed with solution of adrenalin, one to one thousand.

followed immediately by ten per cent of solution of argyrol; the argyrol is objectionable on account of its nasty black staining qualities, but this can be easily remedied by hot water and strong ammonia water, or plain bichloride mercury solution. A simple and effective medical help to clear up this nodular condition is potassium acetate and potassium bromide, 15 grains each; tincture belladonna, 15 minims; menthol, one-half grain; alcohol; syrup of tolu, one-half ounce, and camphor water enough to make four ounces. Mark it two teaspoonfuls every two hours until relieved.

The letter just handed him indicated that the result of the operation for tying off the anterior and posterior fasciculi of another dog reveals a node on the opposite chord as well as upon the same chord as operated upon. The section of the larynges made have also come in this package, and are submitted to the Society. He believed that this operation might be utilized for purposes of correction of voice defect. He wished to state that it was the first research that had been made in the new surgical laboratory for research at the College of Physicians and Surgeons of New York.

Dr. Miller also said many facts are to be learned in the dissections of larynges, as to the relative action of the true and false vocal bands, also as to relative size of the different fasciculi in the female, the chinaman and the negro, also in the comparative anatomy of man, woman, dogs, sheep and calves thyro-arytenoid externus muscles, which would be reserved for another time, as he had already overreached his limit.

Finally, the great importance of this subject will be realized when it is brought to your attention, that most of the cases of voice-failure and fiascos of singers and speakers as well were due to the presence of those vocal nodules, whose appearance is, as a rule, sudden and unprovided for, sometimes absolutely unannounced by any definite symptoms, even what little congestion there might be only led to a temporary climax of effectiveness, all the more startling when the vocal collapse occurred. The poor patient is generally employing specialist after specialist, vocal teachers and voice-restorers, in vain, to bring back his voice, saying that "he has no pain," and cannot understand it. Again resorting to drugs until in a whirlwind of a physic panic, the voice control is thrown to the winds, as it were, the kingdom is without a King, and the previously

successful vocalist drifts into the debris of doubting, defunct has-beens, with a badly shattered nervous system, pulling down and snarling at every attempt at voice resuscitation. Thousands are led annually by incompetent voice-builders in our large cities especially into this state by empirical methods. Parents are sacrificing their all for the golden rewards of the to-be successfully trained silver voice with the beautiful clarion notes of their beloved sons or daughters. His principal object was to bring about a simple and definite cure, also to enable the great multitude of singers who are trying to secure a correct vocal education to obtain it without nodular formation by means of a correct voice science. In other words, empiricism should give way to synthetic principles, which, unfortunately, at present were tabooed. But the synthetic voice-production cannot remain that way much longer, for its principles are being put forth from every side in a broadly convincing and thoroughly definite way, as far as the mechanism of the voice is concerned, which is the part that we, as physicians, are interested in. With regard to the question asked, "How would Dr. Miller illustrate the possibility of this method of vocal synthesis or science?" he illustrated as follows:

Take two children, aged 5 and 7, or about the age of musical appreciation. Place them under the tuition of a competent vocal teacher who understands all the principles of voice anatomy, vocal physiology and has a practical knowledge of all that goes to make up an experienced vocal teacher. Instruct him to bring them out, as far as possible, correct singers. If these children have been taught correctly, later on they will not have to have everything undone by some one who, as a coach or teacher of style and those things which belong to the esthetic side of music, interfere with the correct mechanism.

Perhaps this may more forcefully be illustrated by having these two children with totally different qualities of intelligence learn to recite the poem, "The Night Hath a Thousand Eyes, the Day But One." Say that the younger of the children, on hearing this poem recited by the other with unction and fervor, grasps the whole idea at once, recites it as perfectly as the master did. The second child, the elder, hesitates, looks up to the sky as if witnessing the night and the stars were there in the sky and the sun to represent the other phase

of the thought. One has accomplished it without any effort, the second has to appreciate objectively every material phase of it. Having accomplished this they still must needs go to school, learn the letters of the alphabet, the construction of the words and the various things that belong to grammatical construction of sentences. This virtually cannot be altered by anyone, and it is in just this same spirit and the same mechanical way that Dr. Miller proposes to have the mechanical and the esthetic thoughts of voice science, or vocal synthesis, developed. As it were, driving a nail through a board and clinching it on the other side.

As regards another question asked with reference to massage, he believed that it was the correct way of reducing the size of the nodes if carried on not more than twice a day and ten minutes at a time, as described in the article. No doubt there are cases in which this treatment has been overdone. The speaker had never dared to remove nodes in acute stage and only when they had been organized for some time or modified by papilloma or fibroma. Dr. Otto Chiari, of Vienna, after repeated examinations of nodes, says that a fibroma never arises out of a simple node. The question of minute pathology of the node has been thoroughly taken up in this article, but was not read. It will appear when the article is published. In this discussion it is a wonder that nothing has been said about the distribution of glands upon the vocal cords, some of which are situated in the mucous membrane, and could easily be inflamed and cause similar appearances, but I have never seen anything which indicated that a node was allied to one of these inflamed glands.

PAPER:

A STUDY OF THE ANATOMY OF THE ACCESSORY CAVITIES OF THE NOSE BY TOPOGRAPHIC PROJECTIONS.

HANAU W. LOEB, M. D.,

An accurate comparison of the nasal accessory sinuses of man with one another, and with those of other human heads, has not been possible with the methods in vogue up to the present time. A large degree of error is to be expected in view of the great variety in numbers, form, size and relations, and the difficulty of establishing a definite standpoint for comparison. It is for the purpose of approaching the solution of this problem that this study has been undertaken.

Our knowledge of the morphology of the accessory sinuses has come to us from investigations made for many years, in many ways. One of the earliest methods was that of disarticulated bones, which naturally could give only an indefinite idea of the relations and but meager information of the size and shape.

Examination of the articulated skull possessed the advantage of retaining the sinuses in proper relation, even if they could not all be seen. An important step forward was the use of the articulated skull with portions cut away, so as to show the sinuses as they lie. A moderate understanding of the maxillary, frontal and the sphenoid sinuses may be obtained in this way, and, in specially prepared specimens, the ethmoid labyrinth may be fairly well observed.

A much better plan is to treat the head, with the soft parts attached, in this way. Before the method of decalcification was used, it was necessary to remove the bone with saws, chisels, etc., but with decalcification, an ordinary knife may be employed.

Corrosion preparations, when well made, show the volume and interrelations of the sinuses, supplanting the hollow form by a solid cast. But, of necessity, the specimen from which the preparation was made is destroyed and, hence, the exact relation of the adjacent parts cannot be fixed.

Radiography is of considerable service in demonstrating the outlines of the sinuses, under favorable circumstances.

Serial sections made in sagittal, coronal and horizontal ways show fairly well the relation, size and form of the sinuses, whether they be frozen and sawed, or decalcified and cut with a knife. The chief difficulty, as to comparisons, lies in the fact that it is impossible to secure sections of uniform thickness and of identical positions in a series of heads. As a consequence, the pictures at the level of the sections differ accordingly.

To overcome these difficulties, a plan is here proposed which follows logically the reconstructions as made by numerous biologists, and the work of Jackson* in the study of the relations of the body structures with serial sections, and that of Potter†, by means of which the internal organs of man are accurately reconstructed so as to show their topographic relations. Potter projected the organs in the anterior portions of the chest and abdomen on the anterior surface; those in the posterior portion, on the posterior surface; those on the right side to the right, and those on the left to the left.

Manifestly, while it is desirable to secure an accurate picture of the greatest diameter of the sinuses shown on the corresponding sides, laterally, anteriorly and superiorly, for the purposes of comparison, it is necessary to reconstruct both sets of sinuses on the one side, using the same projection plane; otherwise the comparisons would be full of errors and therefore valueless. On this account it became necessary to modify Potter's method in some particulars.

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*C. M. Jackson. "A Method of Teaching Rational Anatomy." Jour. A. M. A., September 21, 1901.

†Potter. "Topography of the Thorax and Abdomen." 1905.

Potter's method consists in projecting the organs on the surface of the body, as it were, by establishing a base line from which measurements are made on the surface of the section; in each section the extreme distances, centrally and peripherally, of the organ to be reconstructed, are taken from a line connecting the intersecting points of the base line on the surface of the sections, and these are properly designated on millimeter paper, upon which the outline of the body has already been accurately made and the base line accurately indicated. When this is done for the successive sections, the points designate where the upper portions of the section pass through the organs at the greatest and least distance from the base line, taken as zero. The course of the organ in the sections is shown on the millimeter paper after determining it by careful study, measurement and comparison.

Preparation of the Sections.

The head used for the projections was that of a full grown man weighing about 150 pounds, about 5 feet 7 inches in height. It was first injected with a 50 per cent formalin solution, after the method of Jackson, and then immersed in a 3 per cent solution of hydrochloric acid for three months, by which time the bones were entirely decalcified. It was then moderately frozen and sectioned.*

The sections were made as uniform as possible in thickness, both as to different sections and the two sides of the sections.

It was found, that when an attempt was made to cut sections of a decalcified head, moderately frozen, there would be considerable sagging, due to the weight of the head upon the softened framework. Great care was necessary to obtain sections of uniform thickness, which is most essential.

For the purpose of reconstruction and projection, it is not material in what directions the sections are made—horizontal, sagittal or coronal—although the horizontal has been found the most satisfactory and convenient form.

Before the sections are made, the head is photographed, for the purpose of securing as accurately as possible right and

*It is not necessary to freeze the head before making the sections, though this somewhat facilitates the process.

left profiles, and an anterior view. By the use of a rule, placed in the same focus as the head, it was possible to enlarge the photograph so as to secure a natural size picture. The markings which show on the photograph are important in designating the exact position of the sections.

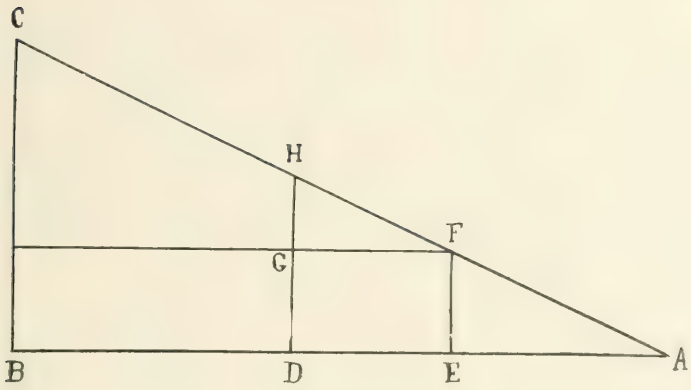
A drawing of the top of each section is now made with India ink on an oblong piece of glass in a frame, care being taken to make the drawing lines directly parallel to the lines of the sections. From the glass it is redrawn on tracing paper. (See Pl. I to VI.)

While the projection can be made without these drawings, they are of great assistance in verification, by furnishing a control for each measurement made on the sections.

There is practically no displacement of the sinuses such as there is from the contracting effects of formalin on soft organs, as these are all encased in bony walls, which, although decalcified, still have a fairly firm framework.

Establishment of the Base Line.

The accurate projection naturally depends upon the correct establishment of the base line, from which the sinuses are to be measured. It is important where comparisons are to be made, that the base line should be more or less uniform for a series of heads, though this is not absolutely necessary. It goes without saying that the line on the sections and that on the projection must occupy the same relative position, otherwise the errors will be innumerable. The lines on the two sides of the head should be in the same plane, perpendicular to the horizontal basal plane of the head. When the sinuses are to be projected to the respective sides of the head, minor or even considerable deviations of the lines on the two sides of the head are of no significance, but where comparisons are to be made between the two sides from projections made on the two sides, the errors become at once manifest. To overcome this, it was found expedient to project first the left sinuses to the left side and the right upon the inverted left outline. The latter gives the proper picture for the projection of the right sinuses on the right side. The possibility of error can be easily calculated.



In the figure here shown, *ab* represents the line connecting the two correct base line points, and *c* the intersection of the incorrect base line with the section. *d* and *c* are corresponding points on the two sinuses to be compared on the two sides of the head. The extreme error would therefore be *gh*, and the lesser errors would be represented by lines parallel to *gh* lying between *g* and *f*, depending on the part of the two sinuses subjected to comparison. The following formula would therefore represent the error, $gh : cb = ed : ab$; wherefore,

$$gh = \frac{cb \times ed}{ab}$$

Given *cb*, or the distance between the true and the false base line as 1 cm. (far more than likely), the error in comparing the sinuses in the lateral projections is shown in millimeters in the following table, taking in each instance the section showing the greatest possibilities in this direction:

Sinus.	Section.	Greatest Error.	Least.	Average.
Maxillary.	5	5.3	2.0	3.65
Sphenoid.	4	2.1	–0.3	0.90
Frontal.	1	2.5	0.	1.25
Anterior Ethmoid. . . .	3	1.7	0.6	1.15
Posterior Ethmoid. . . .	3	1.9	0.4	1.15

It is thus seen that, with the exception of the maxillary sinus, the error is insignificant, and whatever error there is in comparing the maxillary sinuses readily rights itself by the checks which adjacent structures force upon the projector.

In the anterior projection, the error would be much less, the maximum (the sphenoid) being only .04 mm.; in the superior projection, since the measurements are made with reference to both base lines, the error will be equal to that of the lateral or the anterior projection, depending on whether the lateral or the antero-posterior diameter be considered.

The lateral base lines have been drawn through a crease just anterior to the tragus of the ear, and the anterior through the middle line of the nose and occiput, measuring from the two tragi. The superior surfaces of the section were nicked with a knife just where the base lines intersected them, leaving marks so clear that notwithstanding the repeated handling of the sections they still persist. Marks made by ink or pencil did not survive long.

Measurements.

The sinuses are measured with respect to their greatest and shortest distances from a straight line connecting the points of intersection of the two base lines with the superior surface of the section, taken as zero. To facilitate this, a frame has been constructed holding an oblong glass which is ruled with lines 1 cm. apart. One of the lines is placed so as to cover the two intersecting base line points, and the readings are taken posterior and anterior to the measuring line for the lateral reconstruction, and to the right and left for anterior reconstruction. The following are the figures obtained in millimeters:

ANTERIOR RECONSTRUCTIONS.*

LEFT.

Sections.	—One—		—Two—		—Three—		—Four—		—Five—		—Six—	
Profile	84	..	79	..	78	..	74	..	74	..	71	..
Cranial Cavity	70	0	71	0	70	0	65	0	5	03R	50	04R
Frontal	01	18	01R	12	..	..	..	..	..	..	..	..
First Ethmoid	..	..	03	12	05	12	..	..	..	..	..	..
Second Ethmoid	..	..	..	..	04	13	..	..	..	..	..	..
Third Ethmoid	..	..	..	..	03	14	..	..	..	..	..	..
Fourth Ethmoid	..	..	..	..	03	08	..	..	..	..	..	..
Fifth Ethmoid	..	..	..	..	03	14	..	..	..	..	..	..
Sphenoid	..	..	..	..	08R	13	02	17	..	..	..	..
Maxillary	..	..	..	..	..	..	11	27	15	39	17	27
Ear	..	..	..	..	88	..	..	..	..	..	..	..
Septum	..	..	..	..	0	..	03	..	01R	..	..	..
Hiatus-Infundibulum	..	..	..	..	02	05	..	..	..	..	..	..
Inferior Turbinate	..	..	..	..	..	..	..	..	05	15	..	..
First Ethmoid Turbinate	..	..	..	..	02	..	06	13	..	..	..	..
Second Ethmoid Turbinate	..	..	..	..	02	..	10	..	..	..	..	..
Naso-Lachrymal Canal	..	..	..	..	10	12	12	13	..	..	..	..

*All measurements are towards the corresponding side of the base line. Where there is any difference, this is indicated by R (right) and L (left).

RIGHT.

Sections.	—One—		—Two—		—Three—		—Four—		—Five—		—Six—	
Profile	77	..	78	..	77	..	75	..	70	..	68	..
Cranial Cavity	68	0	70	0	68	0	64	0	56	03	48	04
Frontal	22	0	13	01L	..	..	..	..	..	..	..	..
First Ethmoid	..	..	..	..	10	06	..	..	..	..	..	..
Second Ethmoid	..	..	..	..	08	12	..	..	..	..	..	..
Third Ethmoid	..	..	11	09	..	..	..	..	..	..	..	..
Fourth Ethmoid	..	..	..	..	05	14	..	..	..	..	..	..
Fifth Ethmoid	..	..	..	..	03	08	..	..	..	..	..	..
Sixth Ethmoid	..	..	..	..	03	07	..	..	..	..	..	..
Seventh Ethmoid	..	..	..	..	05	10	..	..	..	..	..	..
Eighth Ethmoid	..	..	..	..	03	14	..	..	..	..	..	..
Ninth Ethmoid*	..	..	..	..	03	15	..	..	..	..	..	..
Sphenoid	..	..	..	..	..	..	14	07L	..	..	..	..
Maxillary	..	..	..	..	..	..	25	12	38	14	30	18
Septum	..	..	..	..	02	..	05	14	..	..	..	..
Ear	..	..	..	..	86	..	..	..	..	..	..	..
Hiatus-Infundibulum	..	..	..	..	03	10	..	..	..	..	..	..
Inferior Turbinate	..	..	..	..	05	13	..	..	..	..	..	..
First Ethmoid Turbinate	..	..	..	..	02	..	05	14	..	..	..	..
Second Ethmoid Turbinate	..	..	..	..	02	..	08	..	..	..	..	..
Naso-Lachrymal Canal	..	..	..	..	09	11	12	14	..	..	..	..

*One ethmoid was not cut by the section.

LATERAL RECONSTRUCTIONS.*

LEFT.

Sections.	—One—		—Two—		—Three—		—Four—		—Five—		—Six—	
Profile	71	104P	75	105P	85	103P	95	102P	100	99P	84	89P
Cranial Cavity	54	93P	47	95P	28	93P	2	88P	12	80P	13	68P
Frontal	56	64	43	58	..	..	..	..	..	..	..	..
First Ethmoid	..	..	51	61	47	56	..	..	..	..	..	..
Second Ethmoid	..	..	..	..	37	50	..	..	..	..	..	..
Third Ethmoid	..	..	..	..	33	42	..	..	..	..	..	..
Fourth Ethmoid	..	..	..	..	33	37	..	..	..	..	..	..
Fifth Ethmoid	..	..	..	..	19	33	..	..	..	..	..	..
Sphenoid	..	..	..	..	8	26	2	23	..	..	..	..
Maxillary	..	..	..	..	..	..	27	63	28	61	33	53
Ear	..	..	..	..	12P	38P	..	..	..	..	..	..
Hiatus-Infunibulum	..	..	..	..	42	52	..	..	..	..	..	..
Inferior Turbinate	..	..	..	..	..	..	..	..	31	63	..	..
First Ethmoid Turbinate	..	..	..	..	43	51	32	52	..	..	..	..
Second Ethmoid Turbinate	..	..	..	..	26	42	25	..	..	..	..	..
Naso-Lachrymal Canal	..	..	..	..	57	61	56	58	..	..	..	..

*All measurements except those marked P (posterior) are anterior to the base line.

RIGHT.

Sections.	—One—		—Two—		—Three—		—Four—		—Five—		—Six—	
Cranial Cavity	56	94P	47	95P	23	92P	21	87P	12	80P	13	67P
Frontal	56	66	45	62	..	..	..	..	..	..	..	..
First Ethmoid	..	..	..	..	51	57	..	..	..	..	..	..
Second Ethmoid	..	..	..	..	45	49	..	..	..	..	..	..
Third Ethmoid	..	..	..	..	..	..	42	44	..	..	..	..
Fourth Ethmoid	..	..	..	..	33	43	..	..	..	..	..	..
Fifth Ethmoid	..	..	..	..	36	41	..	..	..	..	..	..
Sixth Ethmoid	..	..	..	..	31	36	..	..	..	..	..	..
Seventh Ethmoid	..	..	..	..	33	36	..	..	..	..	..	..
Eighth Ethmoid	..	..	..	..	28	32	..	..	..	..	..	..
Ninth Ethmoid	..	..	..	..	14	29	..	..	..	..	..	..
Sphenoid	..	..	..	..	..	..	29	6P	..	..	..	..
Maxillary	..	..	..	..	..	..	26	63	26	60	37	55
Ear	..	..	..	..	25	33	..	..	..	..	..	..
Hiatus-Infundibulum	..	..	..	..	43	54	..	..	..	..	..	..
Inferior Turbinate	..	..	..	..	..	..	..	..	35	62	..	..
First Ethmoid Turbinate	..	..	..	..	43	55	31	53	..	..	..	..
Second Ethmoid Turbinate	..	..	..	..	27	42	25	..	..	..	..	..
Naso-Lachrymal Canal	..	..	..	..	56	62	55	58	..	..	..	..

Reconstruction on Millimeter Paper.

A prominent line on the millimeter paper is taken as the base line and each section is indicated by measuring its thickness at the base line and at other points more or less fixed, and by measuring distances from spots shown on photographs of the head. A little practice makes this an easy matter. At the extreme ends, the lines indicating the section levels will curve on account of the perspective; however, ordinary care only is necessary, as the sinuses being centrally placed do not come into relation with the extreme anterior, posterior, right and left portions of the projection. Having projected the lines of the sections on the millimeter paper, they are delimited and the contour established by lines drawn through points on the millimeter paper, in accordance with the measurements of the outline; the particular form of the line connecting the points will depend on the boundaries of the section. This gives an outline of the projected surface with the sections indicated by lines and the base line properly projected.

In accordance with the measurements, points representing the proximal and distal points of each sinus are indicated on the line representing the superior surface of each section in which it appears.

With these points and adjacent structures and reconstructions as guides, the course of the sinuses through the sections is carefully noted and traced on the millimeter paper. (Pl. VII.) A little practice makes it possible to do this speedily and accurately, although it is confusing at first. It must be remembered, that it is possible to represent on the lateral projection only the antero-posterior and supero-inferior diameters, on the anterior projection, the lateral and supero-inferior diameters, and on the superior projection, the lateral and the antero-posterior diameters. In this way each diameter is duplicated in the projections, and is thereby controlled.

It is remarkable how speedily an error is discovered, for there is such an interdependence of the different lines upon one another that the slightest variation from the correct picture manifests itself with no uncertain demonstration. Of course, every part of the work is controlled by repeated verifications.

In making the superior reconstruction, the measurements made for both the lateral and the anterior reconstructions are

used and the points and lines are fixed by using the measured distances of these projections as co-ordinates. This is somewhat difficult and puzzling at first, but the work soon becomes simple, especially if the lateral and anterior projections are kept constantly at hand for comparison.

The plan used for the superior projection, which differs materially from that of the other projections, is always to be followed when making a projection parallel to the sections.

We have, now, accurate lateral, anterior and superior projections of the various sinuses in their greatest diameters, in proper relation to one another and to various other important structures.

The Completed Reconstructions.

Having a correct picture on the millimeter paper, it is an easy matter to transfer it to the tracing paper*, from which it may be retransferred in whole or in part to other drawing papers.

Through the medium of tracing paper, the sinuses with the turbinates and other structures are drawn on white drawing paper, the frontal sinuses being colored yellow, the sphenoid green, the maxillary purple, and the ethmoids red, the anterior group being lined horizontally and the posterior perpendicularly. The turbinates, cranial fossae, naso-lachrymal canals and the floor of the nose are represented by spaced black lines and the contour of the head and the infundibulum, with the hiatus semilunaris, in solid black lines. This makes it possible for the eye to follow the outline of the sinuses and other structures without confusion.

The lateral reconstructions show the sinuses with all their divisions, the turbinates, the floor of the nose, the anterior cranial fossa, the naso-lachrymal canal, and the infundibulum with the hiatus semilunaris. The location of the bulla ethmoidalis is noted as the posterior boundary of the hiatus semilunaris. (Pl. VIII and X.)

The anterior reconstruction shows the sinuses, the ethmoid being differentiated into the consolidated anterior group and

*I am now discarding the drawing on millimeter paper, as it is far simpler and less time-consuming to make the drawing directly on the tracing paper spread over the millimeter paper as a guide.

the consolidated posterior group, as the overlapping would be confusing. The floor of the nose, the bony nasal septum, the turbinates and the naso-lachrymal canal are also shown. (Pl. IX.)

In the superior reconstruction, the sinuses are shown complete, the ethmoid being represented in all its divisions. The infundibulum, the naso-lachrymal canal and the attachment surface of the nasal septum to the nasal roof are also designated. (Pl. XI.)

Reconstructions for Comparisons.

In addition to these, reconstructions are made for the purpose of comparing the sinuses of one side, taken together, with those of the other side. This is done by projecting the sinuses of the right side, colored green, over those of the left side colored yellow. As all projections are thus treated, comparisons are possible between the group of sinuses in all diameters, properly controlled by the duplication in the different projections. In addition to this, each sinus is projected over its fellow, each ethmoid group being considered as one, so that it is possible to compare the contour of each sinus with its fellow in three different projections, comprising a duplication of each of the three diameters.

When these drawings are examined, the resemblance of the figures representing the two sides is so great that it is most striking, especially when the variation in the shape of the individual sinuses themselves is considered. For instance, in the lateral projection it is seen that the diameters of the combined sinuses follow one another with remarkable regularity, and when there is any considerable difference there is, as it were, a compensation in another direction. Thus the sphenoid portion of the right side is seen to extend back of the left side but a trifle more than the left extends above the right. The lower borders of the two groups correspond very closely to each other. (Pl. XII.)

A very similar condition of things is to be observed in the anterior projection. There is very little difference in the figures of the two sides except in the sphenoid region, and there the essential difference is in the position of the internal wall of the sphenoid. (Pl. XIII.)

The same thing may be noted in the superior projection, although here the left ethmoid region is somewhat more per-

ipherally placed than the right, the left sphenoid portion is broader and the right sphenoid portion longer, the total amount of the overlapping being about the same. (Pl. XIV.)

Description of the Sinuses.

In the description which follows, no attempt is made to compare what is found in the projected head with that found in any other head or established by any other form of morphologic study. It is intended only to give an accurate description of what is determined in this head by the projection made after the manner stated.

In the main, the measurements given are those between parallel planes, both because the method of projection fixes the distances in this way, and because where there is any inclination in one direction or another, the difference is insignificant or may be readily computed. For instance, if the distance from plane to plane is 40 mm., and the distance in the other direction is 10 mm., the exact distance according to the well-known formula, the square of the base plus the square of the altitude is equal to the square of the hypothenuse, would be

$$\sqrt{1600+100} \text{ or } 41.6 \text{ mm.}$$

If there be a further distance in another direction, the increase will be corresponding. However, points have been selected where these differences are at a minimum.

Maxillary Sinus.

Left Maxillary. In describing this sinus, no account is taken of the small canal 6 mm. long and 5 mm. in diameter, connecting the sinus with the first anterior ethmoid cavity on the left side. It appears to be an accidental communication close to the opening of the maxillary sinus into the hiatus. (Pl. VIII.)

The left maxillary sinus extends 33 mm. in a vertical direction, 27 mm. laterally, 36 mm. antero-posteriorly, and 5 mm. below the floor of the nose.

The inferior turbinate runs along its inner wall, extending 7 mm. anterior and 10 mm. posterior to the sinus. The turbinate covers the inner wall for a distance of 34 mm. antero-posteriorly, occupying 13 mm. vertically at its widest portion

(5 mm. behind the orifice of the naso-lachrymal canal), and 7 mm. in its narrowest portion, at its posterior extremity.

The first ethmoid turbinate passes downward and backward over the inner wall of the sinus, the anterior border crosses it 10 mm., and the posterior border 25 mm. from the anterior extremity of the sinus. It extends 8 mm. posterior to the sinus, and its lower border is 14 mm. above the floor.

The antero-inferior border of the second ethmoid turbinate lies internal to, above and behind the sinus, but descends 7 mm. below the level of the superior wall.

The naso-lachrymal canal which runs along its internal wall for a distance of 11 mm. reaches it 4 mm. behind its anterior wall.

The hiatus semilunaris comes into relation with the maxillary sinus only in the uppermost part of the internal wall, where it passes obliquely downward and backward for 12 mm.; however, on account of the concavity in the superior wall of the sinus, there is no cavity through 4 mm. of this distance.

The upper level of the sinus lies 1 mm. below the lowest level of the anterior ethmoid cells and 4 mm. above that of the posterior. The internal wall of the ethmoid cells is 10 mm. nearer the median line than the anterior wall of the maxillary in its upper portion and 14 mm. in its lower. (Pl. IX.)

It does not come into direct relation with the sphenoid, the anterior wall of which is 4 mm. behind its posterior extremity; however, the anterior projection shows that the infero-external extremity of the sphenoid is 18 mm. below the level of the superior wall of the maxillary sinus.

The lower wall of the frontal is 10 mm. above the upper wall of the maxillary, which is surmounted by a small tongue of the frontal 7 mm. by 6 mm. (Pl. XI.)

Right Maxillary. The vertical diameter of the right maxillary is 34 mm., the lateral 27 mm., and the antero-posterior 38 mm. Its floor extends 4 mm. below the floor of the nose. (Pl. X.)

The inferior turbinate, whose antero-inferior extremity extends 2 mm. in front of the anterior wall and from 8 to 13 mm. behind the posterior, covers a space on its internal wall 31 mm. long and 12 mm. wide at its widest portion, and 6 mm. at its narrowest.

The first ethmoid turbinate passes downward and backward

over the inner wall, intersecting it 10 mm. and 25 mm. behind its anterior wall, the posterior intersection being 11 mm. in front of its posterior wall. The posterior extremity of the first ethmoid turbinate passes 5 mm. behind the posterior wall of the sinus, whose inferior wall is 16 mm. below the inferior border of the first ethmoid turbinate.

The antero-inferior border of the second ethmoid turbinate just crosses over the postero-superior wall of the sinus, and the posterior border lies above, but almost on a level posterior to the posterior wall of the sinus.

The naso-lachrymal canal reaches the level of the superior wall 4 mm. behind the anterior wall of the sinus, and extends from this place 13 mm. downward.

The hiatus semilunaris extends along the upper wall for a distance of 13 mm., beginning 9 mm. behind its anterior wall and ending 11 mm. in front of its posterior wall.

The anterior ethmoid cells lie above and internal to the maxillary sinus, the posterior likewise, except that posteriorly the internal wall passes internal to their outermost wall to the extent of 1 mm.

This maxillary sinus lies entirely in front of and almost entirely external to the sphenoid, the minimum distance of the planes in the former instance being 2 mm. and the overlapping in the latter being also 2 mm. (Pl. IX.)

The floor of the frontal lies 10 mm. above the roof of the maxillary. The tongue-like projection which overhangs the anterior portion extends laterally 8 mm. and antero-posteriorly 10 mm. (Pl. XI.)

Comparisons. The two maxillary sinuses correspond very closely to each other, the left being slightly greater in a lateral direction, while the right is longer in an antero-posterior and in a vertical direction, except at the level of the canal leading up to the anterior ethmoid. (Pl. XII, XIII and XIV.)

Sphenoid Sinus.

Left Sphenoid. The floor of the left sphenoid projects 9 mm. above the highest level of the floor of the nose, though the vertical distance from the posterior part of the floor is 15 mm. The vertical distances of its roof from these points are 36 mm. and 42 mm. respectively, making its vertical diameter 27 mm. (Pl. VIII.) Its greatest lateral diameter is 27 mm.

and its antero-posterior diameter is also 26 mm. In its upper portion, it projects to the right of the median line about 8 mm., extending 6 mm. beyond a slightly convex nasal septum. (Pl. III, 6.) A large portion lies above its fellow and slightly anterior to it. (Pl. IX and XI.)

It does not come into relation with any other sinus except a large posterior ethmoid, which borders it anteriorly and externally. (Pl. III, 5, and XI.) It projects 7 mm. anterior to the posterior border of this cell and 14 mm. external to its internal wall.

Its anterior wall is 26 mm. from the most anterior portion of the bulla ethmoidalis and 30 mm. from the plane of the posterior wall of the naso-lachrymal canal. It is 16 mm. from the posterior wall of the infundibulum. Its anterior wall lies 41 mm. behind the anterior extremity of the inferior turbinate, and its superior wall lies 19 mm. above the highest level of the inferior turbinate. Its floor almost reaches the lowest level of the first ethmoid turbinate and is 10 mm. below the lowermost level of the second ethmoid turbinate.

Right Sphenoid. The floor of the right sphenoid sinus lies 9 mm. above the highest level of the floor of the nose and 14 mm. above the posterior portion of the floor. The vertical distance to the roof of the sphenoid from these points are 28 mm. and 33 mm. respectively, making the vertical diameter 19 mm. (Pl. X.) The lateral diameter is 22 mm. and the antero-posterior is 29 mm. In its lower portion it projects beyond the median line to the extent of about 7 mm., extending 4 mm. beyond the nasal septum, bent convexly to the right. (Pl. IV, 4.) It lies below the left sphenoid sinus for most of its extent. (Pl. IX.)

The most posterior of the ethmoid cells surmounts it for an antero-posterior extent of 10 mm. and laterally 11 mm. A second posterior ethmoid cell almost reaches it at its anterior external wall. Its anterior wall is 25 mm. posterior to the most anterior point of the bulla ethmoidalis and 32 mm. from the posterior wall of the naso-lachrymal canal. It is 16 mm. from the posterior wall of the infundibulum. Its anterior wall lies 39 mm. behind the anterior extremity of the inferior turbinate and its superior wall lies 12 mm. above the highest level of this turbinate. Its floor is a shade lower than the lower border of the first ethmoid turbinate and 10 mm. below the lowest level

of the second ethmoid turbinate, and its anterior wall is 2 mm. behind the posterior border of the second ethmoid turbinate.

Comparisons. The two sphenoids show a marked difference from each other, the left extending 9 mm. above, 2 mm. below, and 4 mm. to the side of the right sphenoid, while the right extends 8 mm. behind the left. (Pl. XII, XIII and XIV.)

Frontal Sinus.

The frontal reaches the highest level of any of the sinuses. The projections show the possibility of the correctness of the view that the frontal sinuses are simply diverticula of the ethmoid which have been interposed upward between the laminae of the frontal bone.

Left Frontal. The frontal is the most anterior of all the cells on the left side, although the maxillary reaches almost the same plane. Its greatest dimensions are, vertically 30 mm., laterally 20 mm. and antero-posteriorly 21 mm.; 9 mm. from its roof, its anterior wall is at the maximum distance from its extreme posterior wall. At 13 mm. this is reduced to 14 mm.; at 17 mm. it is increased to 15 mm., and at 25 mm. it is only 6 mm. This is due to the recession of the anterior wall which is replaced by an ethmoid cell projected upward to within 11 mm. of the roof of the frontal. (Pl. II, 4 and Pl. VIII.)

The highest point of its roof is 67 mm. above the anterior part of the floor of the nose, 55 mm. above the anterior extremity of the inferior turbinate, 50 mm. above its highest level, 46 mm. above the lowest level of the anterior border of the first ethmoid turbinate, 40 mm. above the junction point of the first ethmoid turbinate with the maxillary sinus anteriorly, 33 mm. above the upper surface of the bulla ethmoidalis. The floor of the cavity is 30 mm. nearer these points.

It descends to 1 mm. above the plane of the roof of the sphenoid sinus, and its most posterior point is 16 mm. in front of the anterior wall of the sphenoid.

Its outer wall lies directly above the supero-internal angle of the maxillary which lies 10 mm. below its inferior wall. (Pl. IX.)

Its relation to the ethmoid cells is well shown. Its upper portion lies above the most anterior ethmoid cell, while its posterior portion, which is vertical, lies between this and the large ethmoid cell immediately behind it. It reaches the infundi-

bulum in this space. It thus has the appearance of an ethmoid cell lying between the two others, but reaching a point 11 mm. higher than the one and 21 mm. higher than the other, and extending laterally almost twice and antero-posteriorly one and one-half times as far as either of these cells. The anterior wall of the first posterior ethmoid cell lies 1 mm. behind its posterior extremity, and that of the most posterior ethmoid cell, 11 mm. (Pl. VIII.)

Right Frontal. The frontal is the most anterior of all the sinuses on the right side, being 5 mm. anterior to the ethmoid and 2 mm. to the maxillary. Its greatest diameters are vertically 30 mm., laterally 24 mm., and antero-posteriorly 22 mm. Its anterior wall passes quite uniformly downwards and backwards, while the posterior wall, after passing almost parallel to this for three-fourths of its distance, turns sharply backwards. As a consequence, the maximal antero-posterior diameter is at the lower part of the sinus, while the minimal is at the roof. (Pl. X.)

The roof is 68 mm. from the anterior part of the floor of the nose, 59 mm. from the anterior extremity of the inferior turbinate, 52 mm. from its highest level, 47 mm. above the inferior level of the anterior end of the first ethmoid turbinate, 42 mm. from the intersection of the first ethmoid turbinate with the maxillary, 34 mm. from the highest level of the bulla ethmoidalis. The floor is 30 mm. nearer these points.

It is 10 mm. above the roof of the sphenoid, the anterior wall of which is located 21 mm. behind its posterior wall. Its outer wall lies directly above a small portion of the maxillary sinus to the extent of 10 mm. laterally.

It is superimposed immediately above the anterior ethmoid group of cells and is in contact with the two upper cells of this group. One of these cells extends 2 mm. behind the posterior wall, and while the other extends anterior to the lower portion of the anterior wall, it is overhung by the upper portion.

The most posterior of the ethmoid cells lies 2 mm. behind its posterior wall.

Comparisons. The right frontal is much larger than the left frontal, the anterior wall of the latter being replaced by the ascending anterior ethmoidal cell. These two taken together about equal the right frontal in size and shape. There is very little difference in the vertical diameter of the two

sinuses, but the right extends a considerable distance more externally and a small distance more anteriorly. (Pl. XII, XIII and XIV.)

Ethmoid Cells

Left Ethmoid. The left ethmoid labyrinth lies below the frontal, above and internal to the maxillary, and in front of the sphenoid. On the left side, the greatest vertical diameter is 34 mm., the antero-posterior 42 mm., and the lateral 12 mm.

The anterior group is composed of two large cells, the first running downwards and backwards, the other downwards and forwards. The infundibulum lies inward between these, although the inner wall of the first ethmoid is on the same level internally. The bulla ethmoidalis is constituted by the inner and the infero-anterior wall of the second cell. The first cell extends 11 mm. higher than the second, and the latter 5 mm. lower than the former.

The following show the distances from the highest levels of the two cells taken together: Floor of the nose, anterior level, 56 mm., anterior end of the inferior turbinate 44 mm., highest level of inferior turbinate 39 mm., lowest level of the anterior border of the first ethmoid turbinate 35 mm., intersection of the first ethmoid turbinate with the wall of the maxillary sinus 27 mm., upper border of the bulla ethmoidalis 22 mm. At the level of the upper border of the bulla ethmoidalis, which lies at the posterior wall of the first cell, the first cell extends 8 mm. anterior and the second 12 mm. posterior. The second cell overlaps the first posterior ethmoid cell antero-posteriorly almost the entire distance. The posterior wall of this cell lies 8 mm. anterior to the anterior wall of the sphenoid sinus. (Pl. VIII.)

The posterior group of cells consist of three cells, two of which are large, constituting the superior, posterior, and anterior, and a much smaller one lying inferiorly. They encroach 7 mm. upon the sphenoid and 7 mm. upon anterior ethmoid, antero-posteriorly.

Right Ethmoid. The right ethmoid labyrinth comprises ten distinct cells, of which four belong to the anterior group and six to the posterior. The greatest vertical diameter is 28 mm., its lateral 12 mm., its antero-posterior 47 mm. The dimensions of the anterior group, considered from the stand-

point of the greatest diameters, are vertically 20 mm., laterally 7 mm., and antero-posteriorly 29 mm. The corresponding dimensions of the posterior group are 25 mm., 12 mm., and 29 mm.

The infundibulum lies internal to the anterior group of cells and anterior to the posterior group. The bulla ethmoidalis is formed by the anterior wall of the two lower anterior ethmoid cells. The most anterior ethmoid cells lies just below the frontal and internal to the naso-lachrymal duct, above the level of which most of it is situated. The second cell, which is behind the first cell, lies below the frontal and extends somewhat posterior to it. Below this cell are to be found the two cells whose anterior walls constitute the bulla ethmoidalis. The first of these is only half the length, antero-posteriorly, of the second cell, placed immediately below. The last cell is the only one of the anterior ethmoid cells which projects into the region of the posterior ethmoid, the overlapping antero-posteriorly being 10 mm. and vertically 9 mm. The following show the distances from the highest level of the cells of the anterior group: Floor of the nose, anterior level, 48 mm., anterior end of the inferior turbinate 39 mm., upper level of the inferior turbinate 32 mm., lowest level of the anterior border of the first ethmoid turbinate 26 mm., intersection of the first ethmoid turbinate with the wall of the maxillary sinus 22 mm., upper border of the bulla ethmoidalis 14 mm. The first cell extends 12 mm. anterior and 2 mm. posterior to the antero-superior border of the bulla ethmoidalis. The floor of the second cell is 5 mm. above it, and extends 7 mm. behind it. As already stated, the wall of the bulla is a portion of the anterior wall of the two other anterior ethmoid cells. As the upper part of the bulla is 8 mm. above the intersection of the first ethmoid turbinate and the maxillary sinus, 25 mm. above the anterior end of the inferior turbinate, and 34 mm. above the floor of the nose, the distances of these structures from the floor of the four cells can be readily ascertained. The bulla is 13 mm. behind the anterior end of the inferior turbinate. (Pl. X.)

The posterior group of cells may be considered as a cavity with numerous septa dividing it into smaller cells, occupying the lateral mass of the ethmoid bone behind the anterior ethmoid cells. They lie above and in front of the sphenoid and

above, behind and to the inner side of the maxillary. The most posterior cell overlaps the sphenoid to the extent of 10 mm., being directly in relation laterally and posteriorly with the sphenoid on the other side. Below this is a narrow cell which approaches the maxillary and follows it for a distance of 15 mm.

Comparisons. The left anterior ethmoid cells appear to be very much more extensive than the right, by reason of the very large ascending anterior ethmoid cell. It is by reason of this that the left anterior ethmoid group of cells reaches a level 6 mm. above that of the right, and extends 4 mm. in front.

The right posterior ethmoid cells are manifestly much larger than the left and appear so in every diameter except the vertical. They lie 3 mm. more internal than those of the left side. (Pl. XII, XIII and XIV.)

Orifices of the Sinuses.

In addition to the reconstructions already described, two others have been made, showing the different orifices in their relation to the turbinates, naso-lachrymal canal and other structures. (Pl. XV and XVI.)

The most conspicuous figures in these drawings are those of the infundibulum, hiatus semilunaris and the fossa behind the bulla. The bulla projects, as it were, between the infundibulum above, the infundibulum and hiatus in front, and this fossa behind.

The left infundibulum is 10 mm. in an antero-posterior direction and 5 mm. in a lateral direction. Its anterior half is continued downwards and backwards, by a cleft between the uncinate process and bulla, for a distance of 14 mm. Its posterior half opens into a fossa 6 mm. deep, which passes almost directly downwards.

The right infundibulum is 12 mm. antero-posteriorly and 6 mm. laterally; its anterior half is continued downward, and then backwards, more horizontally than on the other side, for a distance of 20 mm. Its posterior half opens into a fossa corresponding to that on the opposite side, running almost directly downwards for 6 mm.

On the left side, the infundibulum receives the orifice of the frontal through its roof, and of the maxillary in its extension,

just where it changes its direction from downward to downward and backward. The fossa behind the bulla receives the opening of the second anterior ethmoid cell at its lowest portion. The first anterior ethmoid cell, as has already been stated, opens into the maxillary. The three posterior ethmoid cells open into the superior meatus, two anterior to the anterior border of the second ethmoid turbinate, and two behind it. (The most anterior cell of this group has two openings, one anterior, the other posterior to the border.) The orifice of the sphenoid is entirely behind the second ethmoid turbinate.

The orifices of the maxillary sinus, the second anterior ethmoid, the small posterior ethmoid lying just above the maxillary, and the sphenoid are on a line but slightly inclined from the horizontal, the difference in level between the first and last of these being 5 mm. The opening of the most posterior ethmoid is 3 mm. below this, of the other posterior ethmoid 1 mm. above, and of the frontal 8 mm. above. The orifice of the maxillary sinus is 31 mm. above the highest level of the floor of the nose, 19 mm. above the level of the anterior extremity of the inferior turbinate, and 11 mm. above the lowest level of the anterior border of the first ethmoid turbinate. The orifices lie the following distances behind the anterior border of the first ethmoid turbinate; frontal 5 mm. maxillary 3 mm., second anterior ethmoid 8 mm., posterior ethmoid 13 mm., 17 mm., 19 mm., and 28 mm., respectively, and the sphenoid 29 mm. The naso-lachrymal canal is 3 mm. farther away. The distances from the anterior extremity of the inferior turbinate are as follows: frontal 19 mm., maxillary 17 mm., second anterior ethmoid 22 mm., posterior ethmoid 27 mm., 31 mm., 33 mm., and 41 mm., respectively, and the sphenoid 43 mm. The distances from the floor of the cranial fossa at the corresponding levels are as follows: frontal 13 mm., maxillary 23 mm., second anterior ethmoid 19 mm., posterior ethmoid 12 mm., 17 mm., 12 mm. and 16 mm., respectively, and the sphenoid 14 mm.

On the right side, the frontal opens on the roof of the infundibulum, the maxillary in the horizontal portion; the two upper anterior ethmoid cells open also into the infundibulum, as well as the cell constituting the upper portion of the bulla ethmoidalis. The cell constituting the lower portion opens into the fossa which extends downward from the infundi-

bulum. The six posterior ethmoid cells open into the superior meatus, all but one being above the antero-inferior border of the superior turbinate. The sphenoid opens 7 mm. behind the posterior border of the second ethmoid turbinate.

The distances of the orifices from the highest level of the floor of the nose are as follows: frontal 31 mm., anterior ethmoid 35 mm., 38 mm. (two) and 32 mm., respectively; posterior ethmoid 29 mm., 27 mm. (three), 33 mm., 26 mm., respectively. maxillary 27 mm., sphenoid 25 mm. The distances above the level of the anterior extremity of the inferior turbinate are: frontal 30 mm., anterior ethmoid 26 mm., 29 mm. (two), 23 mm., respectively; posterior ethmoid 20 mm., 18 mm. (three), 24 mm., and 17 mm., respectively; maxillary 18 mm., and sphenoid 16 mm. Above the lowest level of the anterior border of the first ethmoid turbinate, the distances are: frontal 16 mm., anterior ethmoid 12 mm., 15 mm. (two), and 9 mm., respectively; posterior ethmoid 6 mm., 4 mm. (three), 10 mm., and 3 mm., respectively; maxillary 4 mm., sphenoid 2 mm. The orifices lie the following distances behind the anterior border of the first ethmoid turbinate; frontal 3 mm., anterior ethmoid 3 mm., 8 mm., 9 mm., and 10 mm. respectively; posterior ethmoid 15 mm., 19 mm., 21 mm. (two) 25 mm., and 28 mm., respectively; maxillary 8 mm., and sphenoid 35 mm. The naso-lachrymal canal is 1 mm. farther away. The distances from the anterior extremity of the inferior turbinate are 7 mm. greater.

Conclusions.

The method of study here presented and carried out in detail on the head described, gives an accurate picture of the different diameters of the sinuses shown by reconstructions, anteriorly, superiorly and laterally. It is possible through this to obtain the distances of the sinuses from more or less fixed and accessible structures in or about the nose.

The error is reduced to a minimum, being no greater than that which follows from the grossness of all macroscopic measurements in connection with the human body. All measurements are thus subject to an error of 1 millimeter, far less than can not be noted by the eye except under the most favorable circumstances.

While the method deals particularly with the greatest diame-

ters of the sinuses, it may be utilized to reconstruct any portion of an organ large or small. In this way, a study may be made of special details, without reference to the complete reconstructions. By no other method can comparisons in the shape or position of the sinuses be so accurately made. For here we have any plane or the composite plane fixed in such a manner that comparisons may be made by superimposing one projection upon the other. It is just as easy to reconstruct one wall of a sinus as all the walls, hence, one may choose his own problem in this connection.

The preparations from which these reconstructions are made, are not destroyed, but preserved, so they may be used for control, study and comparisons for other methods as well as this.

A series of heads reconstructed in the manner indicated will certainly give valuable information as to the character of the variations of the sinuses, and their relations with one another and other structures. It will be easy, when a sufficient number of heads have been reconstructed, to draw a composite of the sinuses, showing their average shape, position and relations.

Grateful acknowledgment is made to Dr. Peter Potter, for his cordial advice and assistance in the beginning of this work, and to Miss Alice Ethel Hamilton, who has so faithfully executed the drawings and assisted in the reconstructions.

DESCRIPTION OF PLATES.

Plate 1.—1. Right frontal sinus; 2. Left frontal sinus; 3. Roof of orbit; 4. Superior longitudinal sinus; 5. Falx cerebri; 6. Fissure of Sylvius; 7. Island of Reil; 8. Frontal operculum; 9. Anterior horn of lateral ventricle; 10. Posterior horn of lateral venticle; 11. Optic thalamus.

Plate II.—1. Right frontal sinus; 2. Anterior ethmoid cell; 3. Left frontal sinus; 4. Anterior ethmoid cells displacing anterior wall of the frontal sinus; 5. Crista galli; 6. Fissure of Sylvius; 7. Eye muscles; 8. Lachrymal gland; 9. Superior longitudinal sinus; 10. Lateral ventricle; 11. Third ventricle; 12. Pineal gland; 13. Aqueduct of Sylvius; 14. Opening into pitnitary body and foramina of Munro.

Plate III.—1. Naso-lachrymal canal; 2. Infundibulum; 3. Anterior ethmoid cells; 4. Anterior ethmoid cell which replaces anterior wall of the frontal sinus; 5. Posterior ethmoid cells; 6. Left sphenoid sinus lying above the right; 7. Optic nerve; 8. Descending horn of lateral ventricle; 9. Pons; 10. Cerebellum; 11. Superior longitudinal sinus.

Plate IV.—1. Naso-lachrymal canal; 2. First ethmoid turbinate; 3. Maxillary sinus; 4. Sphenoid sinus; 5. Fifth nerve and Gasserian ganglion; 6. Temporo-sphenoidal lobe; 7. Cerebellum; 8. Lateral sinus; 9. Fourth ventricle; 10. Pons; 11. Internal carotid artery.

Plate V.—1. Maxillary sinus; 2. Nasal septum; 3. Inferior turbinate; 4. Temporomaxillary articulation; 5. External auditory canal; 6. Mastoid cells; 7. Lateral sinus; 8. Middle ear; 9. Internal carotid; 10. Semicircular canals; 11. Cerebellum; 12. Medulla; 13. Eustachian tube; 14. Fourth ventricle; 15. Basilar artery.

Plate VI.—1. Pharynx; 2. Maxillary sinus; 3. Roots of teeth; 4. Parotid gland; 5. Mastoid cells; 6. Lateral sinus; 7. Jugular; 8. Internal carotid; 9. Cerebellum; 10. Medulla.

Plate VII.—The sinuses with their orifices, the infundibulum, the cranial cavity, turbinate, naso-lachrymal canal and floor of the nose of the left side are shown as they are reconstructed on millimeter paper, the sinuses and infundibulum being represented by solid lines and the other structures by broken lines.

Plate VIII.—Left lateral reconstruction. In this and Plates IX, X and XI the frontal sinus is colored yellow, the maxillary purple, the sphenoid green and the ethmoid red, the anterior group being lined horizontally and the posterior group perpendicularly. The ethmoid cells are to be noted in two groups, the anterior, three in number, and the posterior, two. The first anterior cell is shown displacing the anterior wall of the frontal and opening into the maxillary sinus. The frontal is seen opening into the infundibulum. The antero-inferior wall of the second ethmoid cell constitutes the bulla ethmoidalis (posterior boundary of the infundibulum).

Plate IX.—Anterior reconstruction. On account of the multiplicity of lines, the individual ethmoid cells are not shown; however, the two groups are represented, the anterior being lined horizontally and the posterior perpendicularly. The left sphenoid sinus lies far above the right; its inner wall extends almost as far to the right as the outer wall of the right sphenoid sinus.

Plate X.—Right lateral reconstruction. The frontal sinus is seen opening into the infundibulum, its inferior wall only being encroached upon by the ethmoid cells. There are four cells belonging to the anterior group of ethmoid cells and five to the posterior. The bulla ethmoidalis is formed by the anterior wall of the two most posterior anterior ethmoid cells.

Plate XI.—Superior reconstruction. The right sphenoid sinus extends almost as far to the left as the left does to the right, while the right lies much more posterior and the left much more anterior. The difference between the right and the left ethmoid cells is well shown.

Plate XII.—Lateral reconstruction: in this and Plates XIII and XIV the sinuses of the right side are colored green and the left yellow. F, frontal; A. E., anterior ethmoid; P. E., posterior ethmoid; S., sphenoid; M., maxillary.

Plate XIII.—**Anterior reconstruction; F., frontal; A. E.,** anterior ethmoid; **P. E., posterior ethmoid; S., sphenoid; M.,** maxillary.

Plate XIV.—**Superior reconstruction; F., frontal; A. E.,** anterior ethmoid; **P. E., posterior ethmoid; S., sphenoid; M.,** maxillary.

XV.—**Left lateral reconstruction showing the orifices of** the sinuses in relation to the turbinates, infundibulum, cranial cavity, and naso-lacrymal canal.

XVI.—**Right lateral reconstruction showing orifices of the** sinuses in relation to the turbinates, infundibulum, cranial cavity and naso-lacrymal canal.

DISCUSSION.

Dr. J. A. Stucky showed some skiagraphs. He said there was nothing more uncertain than the size of the accessory sinuses, especially the frontal. He had concluded that it was unsafe to enter these cavities without first having some anatomical guide as given by the radiograph. He showed seven different views, and, had he not taken the picture, he would have made mistakes in some of the cases. One shows a very large double frontal sinus, in which, when it was opened above the orbital ridge, pus and granulations were found. The radiographs were made by Dr. J. C. Lewis, and he said there was another sinus, and with a little tapping with the rongeur it was penetrated, and as large a posterior one was found as the anterior. Lewis has been able in 11 out of 13 cases to tell where pus would be found.

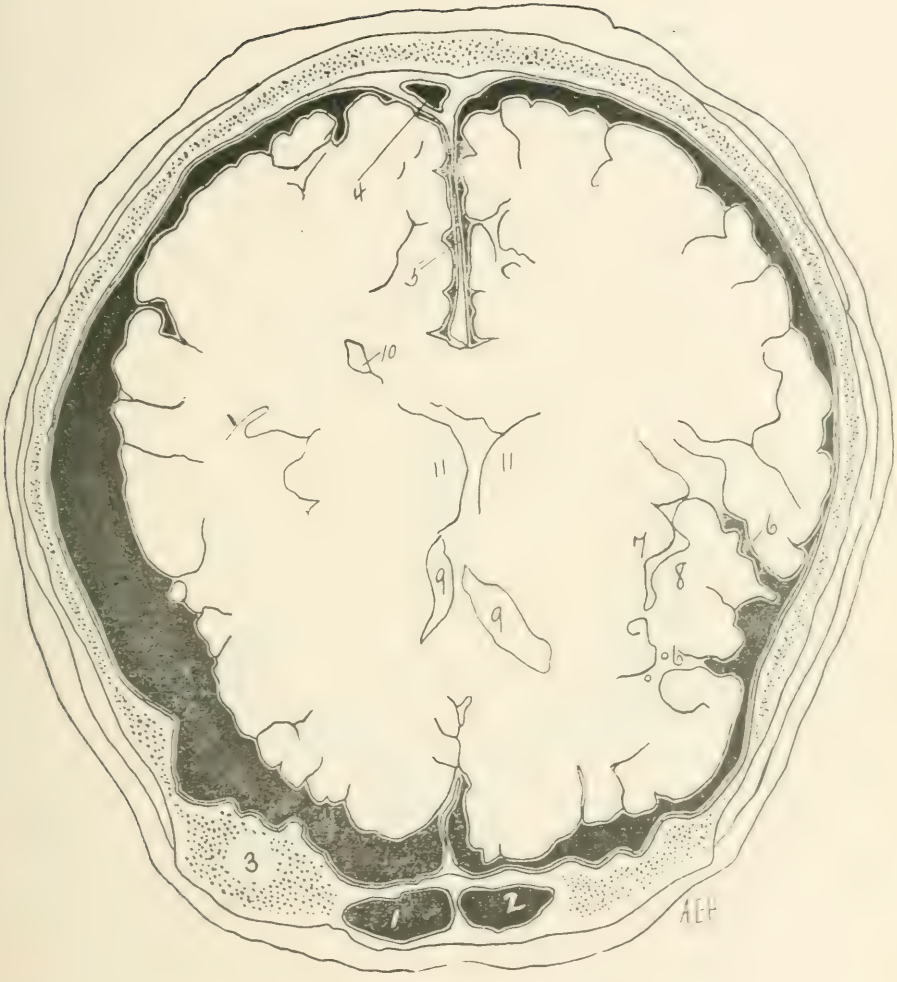
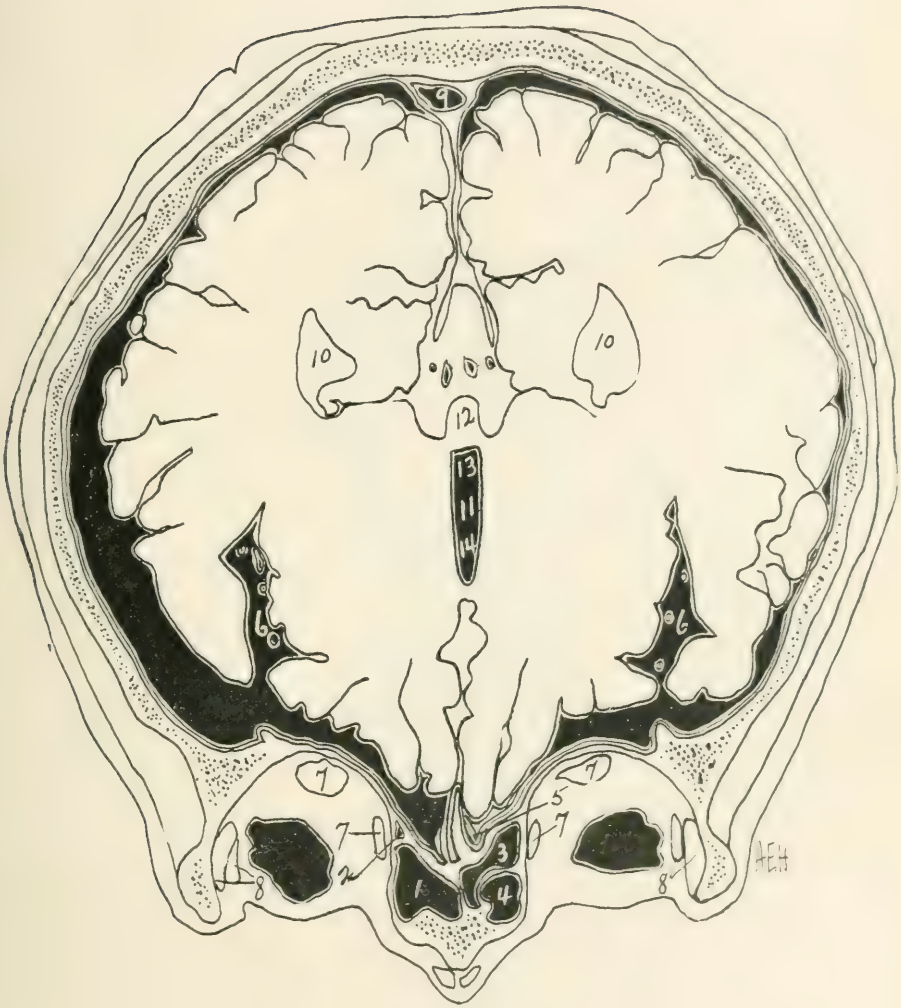


PLATE I.



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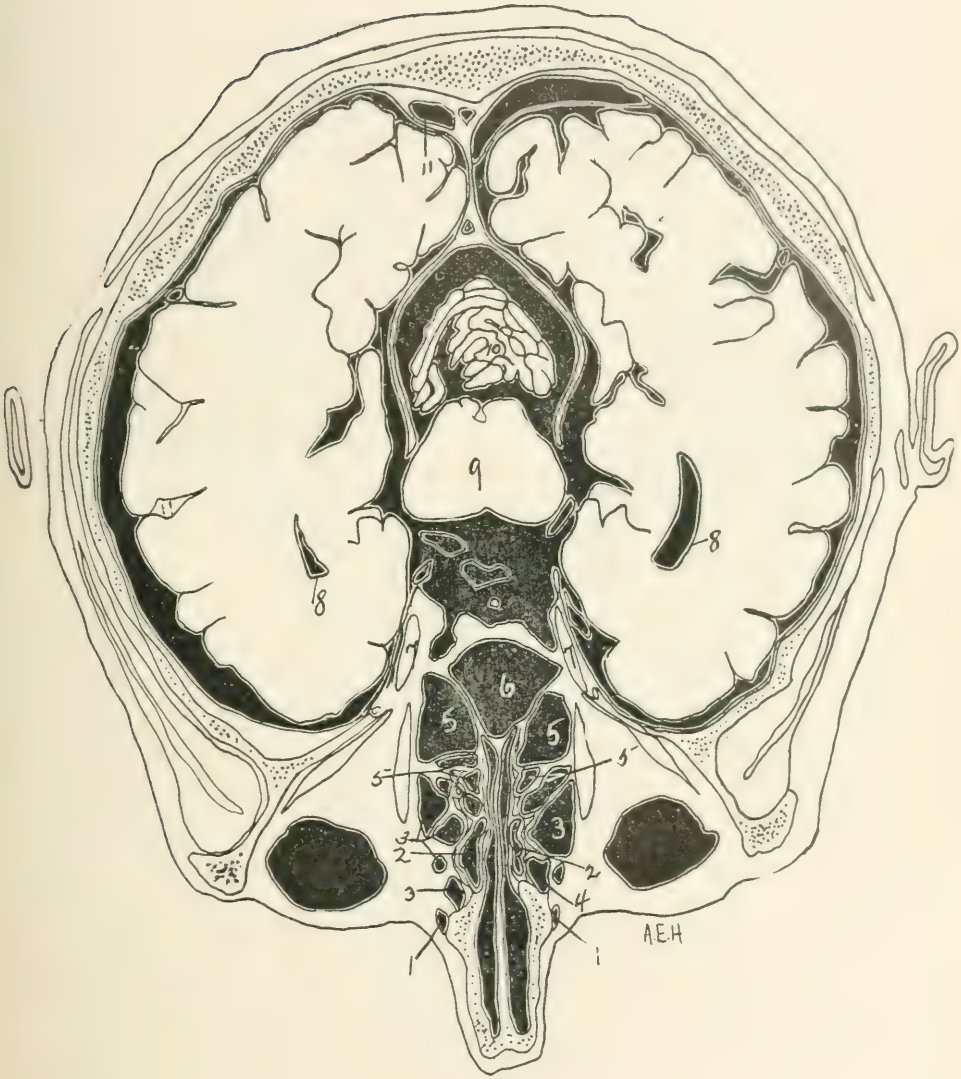

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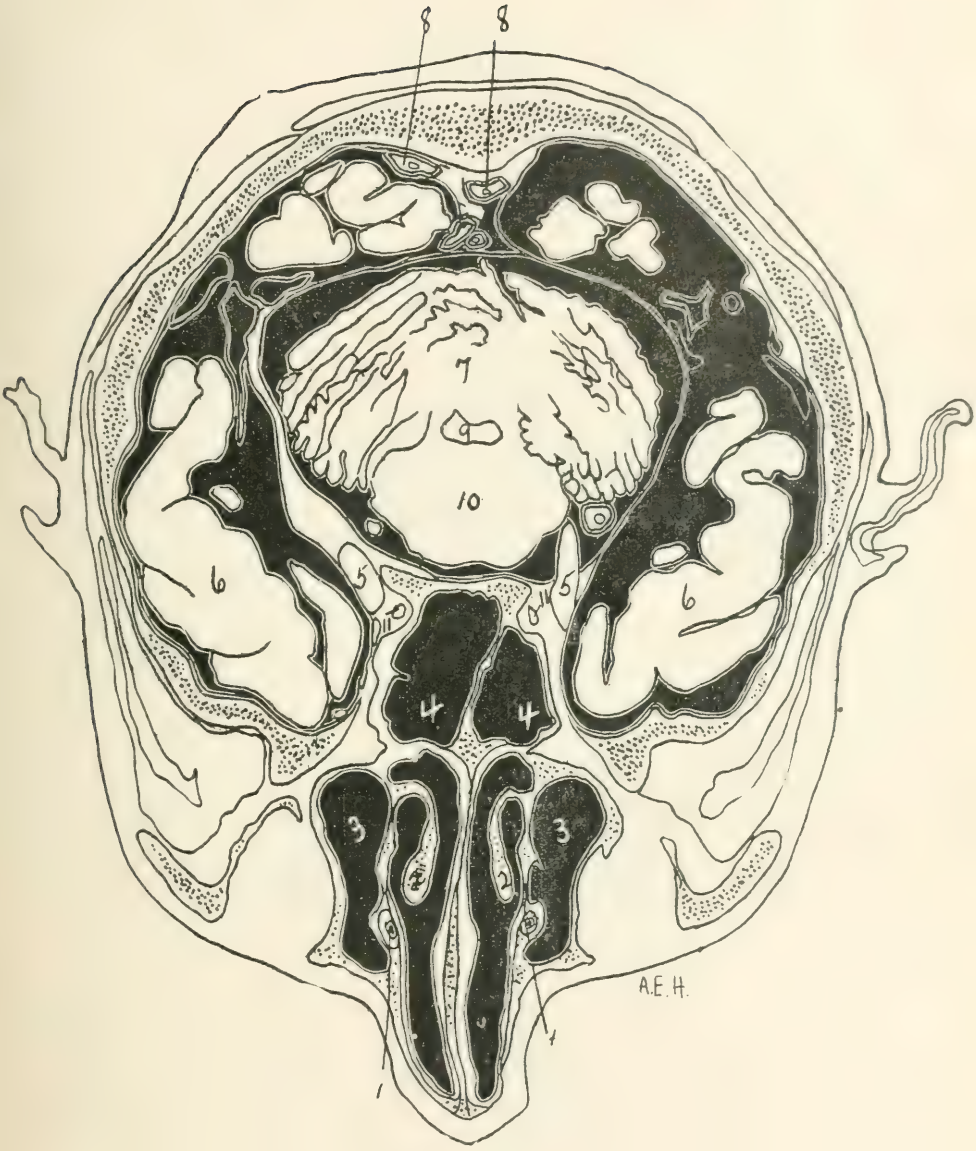

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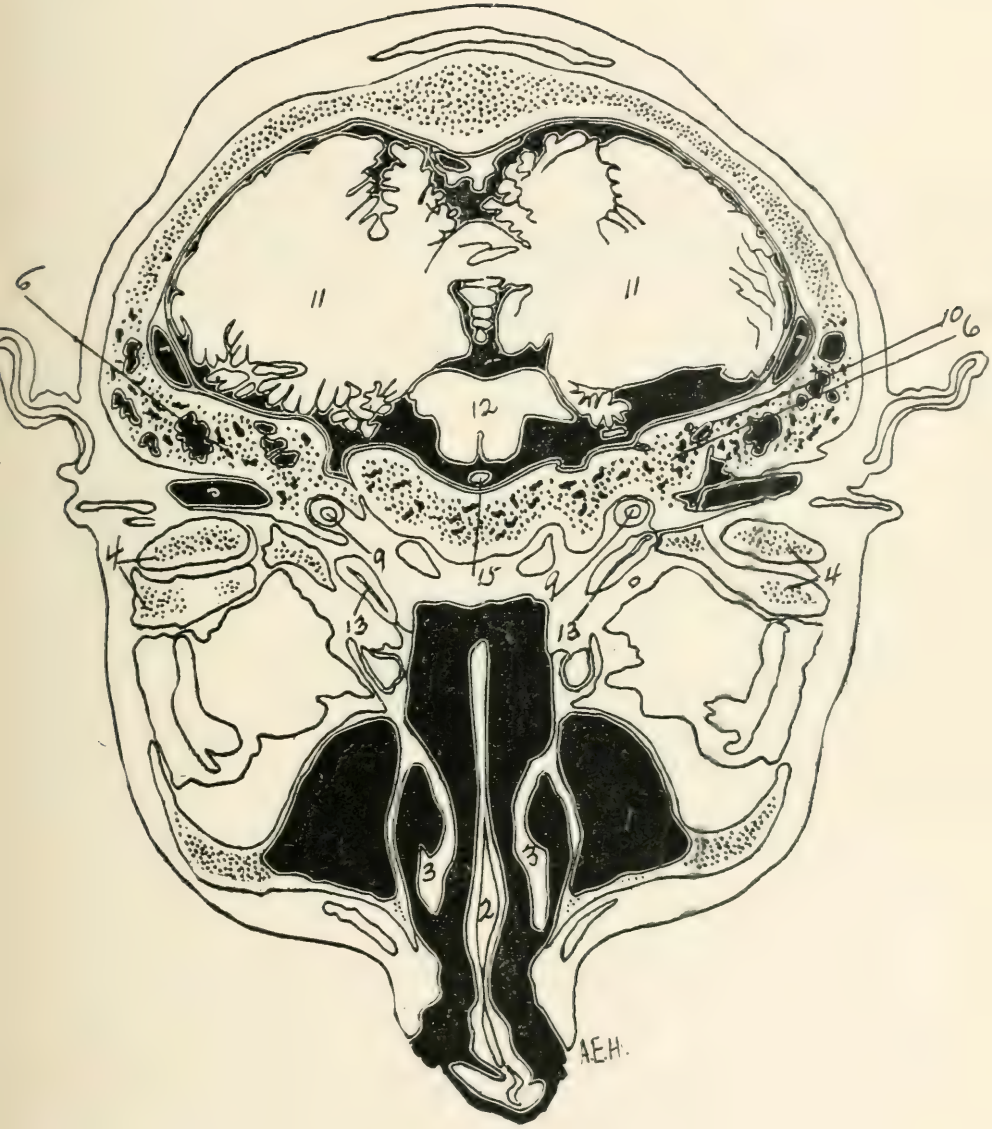


PLATE V.

PLATE VI.

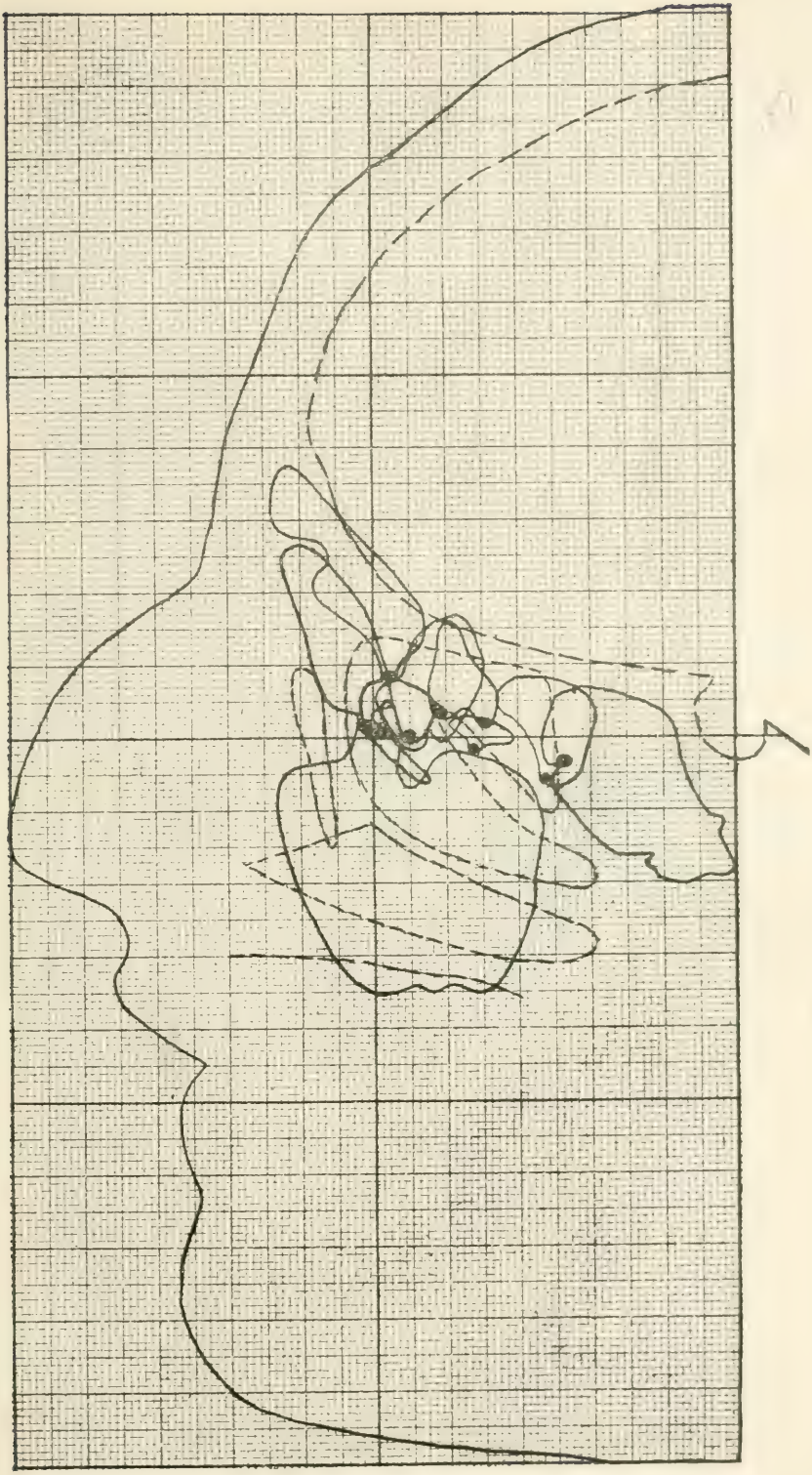


PLATE VII.

PLATE VIII.

Alice Ethel Hamilton.

PLATE IX

PLATE X.

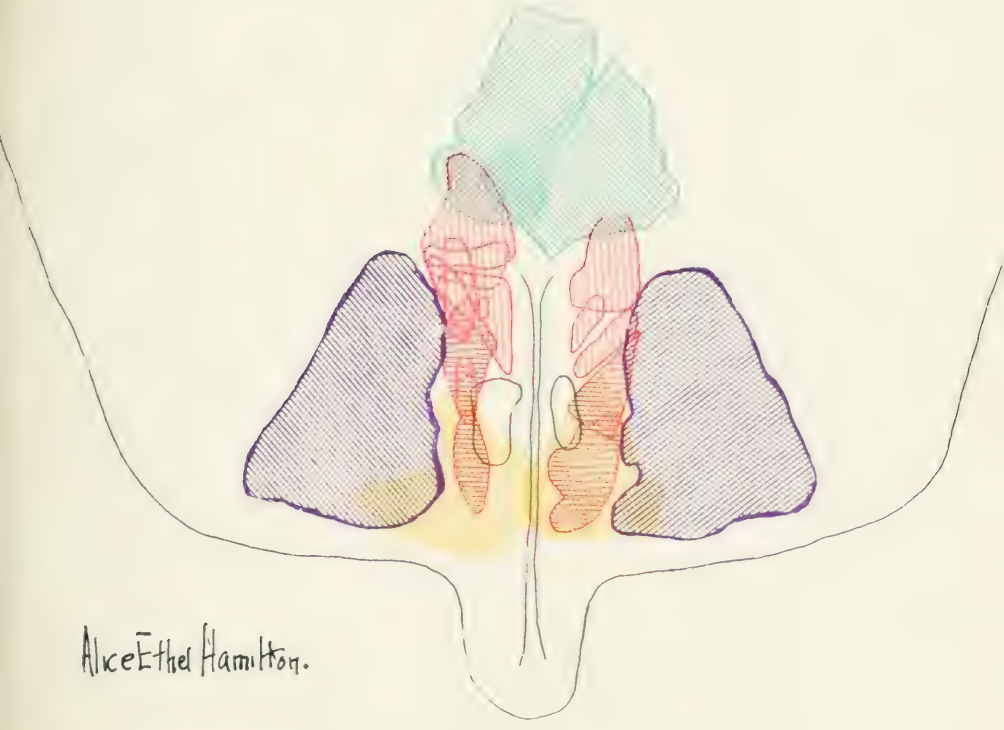


PLATE XI.

I

V. P.

L. P.

M

Alice Ethel Hamilton.

PLATE XII.

A E

P F

M

I

Alice Ethel Hamilton.

PLATE XIII.

PLATE XIV.

PLATE XV.

PLATE XVI.

PAPER:

THE FUNCTION OF THE ACCESSORY CAVITIES OF THE NOSE.

J. M. INGERSOLL, M. D.

The functions of most of the organs of the body are so well known that, with our present knowledge, these functions seem almost self-evident. There are, however, some organs which are apparently functionless and are usually considered vestigial or rudimentary. They were formerly of greater physiologic importance, but in the course of generations, in consequence of adaptation of the body to special conditions of life, they have been subjected to reduction or degeneration and now remain simply as vestiges. Their presence can be explained only by the theory of selection, and in this connection, two important factors must be considered, namely, heredity and the capability of variation.

Heredity is conservative and tends to retain the ancestral characters. The capability of variation is influenced by external conditions and results in the modification of structures. The resulting adaptations as far as they are useful to the organism concerned, are transmitted to future generations. Thus heredity and adaptation are parallel factors, and the knowledge of this fact helps us to explain the presence of various rudimentary organs in the adult.

With these general principles in mind, the study of the comparative anatomy of the accessory cavities of the nose, should teach us what their function has been and whether or not they are now functionally active in man.

FISHES.—In fishes there are no accessory cavities of the nose. Their nose is a simple sack-like structure and does not communicate with the mouth, except in Dipnoi.

Dipnoi are fishes which live in shallow streams, and while in the water breathe through their gills as other fishes do.

Their nose communicates with the mouth, and they have a functional lung and resemble reptiles in some other respects. In the dry season, they live in the mud and breathe through their nose, and thus the nose becomes a part of the respiratory system.

Reptiles.—In reptiles the nasal cavities are more complicated. Each nasal fossa is divided in a general way, into a respiratory portion, situated anteriorly, and an olfactory portion, situated in the posterior superior part of the nose. This olfactory region contains the sensory nerve cells, and a rolled turbinal springs from its outer wall.

Birds.—In birds the turbinals all show a higher degree of development. Their form varies greatly; some are simple prominences and some are decidedly scroll shaped or even present a double coil, the superior coil making one complete turn and the inferior coil making two or more turns within itself.

There are no accessory cavities of the nose, but the bones of the skull, like some of the other bones in birds, contain large air cells or cavities to make the bones lighter.

Mammals.—In mammals, the turbinals and the nasal accessory cavities exhibit great variations, each showing a high or low degree of development, according to the environment of the animal.

Kangaroo (Macropus.)—The kangaroo occupies quite a low position in the mammalian scale, but its nose is much more highly developed than the nose in any of the birds.

The nasal fossae are two symmetrical cavities completely separated from each other in the median line by the septum. The maxillary turbinals correspond to the inferior turbinals in man. There is one in the anterior part of each fossa. Each one projects outward and upward from the maxillary bone, beginning as a thin shelf-like process which divides into numerous curved branches partially filling the anterior half or respiratory portion of the nose (Plate I, Figures A and B, 2). The function of the maxillary turbinals is to prepare the inspired air for respiration.

The posterior part of the vomer gives off two lateral wings, one on each side, which extend across the nasal fossae and unite with the ethmoidal bones, thus dividing each fossa pos-

teriorly into two superimposed cavities (Plate I, Figures C and D, 6). The superior cavities contain most of the ethmoidal turbinals and constitute the olfactory portion of the nose. The inferior cavities are tube-like structures and form a direct communication between the anterior or respiratory portion of the nose and the nasopharynx (Plate I, Figures C and D, 7).

There are five ethmoidal turbinals in each fossa. They spring from the convex surface of the cribriform plate of the ethmoidal bone and give off numerous branches which extend anteriorly into the nose. Some of them articulate with and are supported by the frontal, nasal and superior maxillary bones, but none of them unite with the septum (Plate I, Figures B, C and D, 3). The numerous branching and curved processes of the ethmoidal turbinals are all covered by olfactory mucous membrane and thus a large surface is exposed in a comparatively small area. The function of the ethmoidal turbinals is olfactory.

The maxillary sinuses are simple diverticula between the anterior inferior parts of the ethmoidal turbinals and the superior maxillary bones (Plate I, Figure C, 5). They can hardly be called sinuses, but are rather large channels which lead from the respiratory portion of the nose to the external portion of the ethmoidal turbinals and thus bring a large olfactory surface in direct communication with the inspired air.

The ethmoidal cells are spaces between some of the branches of the ethmoidal turbinals and the adjacent bones of the skull (Plate I, Figures B and C, 4). They communicate directly with the maxillary sinuses and thus conduct the air over a still greater surface of the olfactory turbinals.

There are no frontal or sphenoidal sinuses in the kangaroo's skull. Thus in the kangaroo, the olfactory or ethmoidal turbinals are situated in the posterior superior part of the nose. Their internal surfaces are exposed directly to a part of the inspired air after it has passed through the branches of the maxillary turbinal. The maxillary and ethmoidal sinuses, which are the only ones present in the kangaroo, serve as channels to conduct some of the inspired air over the external lateral surfaces of the ethmoidal turbinals and so expose these portions of the olfactory turbinals more directly to the inspired air and are, therefore, functionally active in increasing the acuteness of the sense of smell.

Deer (Cervus).

A longitudinal section through the deer's head shows three ethmoidal turbinals (Plate II, Figure A, 2), and a large maxillary turbinal (Plate II, Figure A, 1), all of which present comparatively smooth surfaces. Transverse sections through these turbinals show them to be highly developed and very complicated structures.

The maxillary turbinal is a double coil. It springs from the superior maxillary bone as a thin shelf-like process, parallel to the floor of the nose, extending two-thirds of the way across the fossa. It then divides into two processes, the superior one makes three complete turns within itself and the inferior one makes two turns (Plate II, Figures B, C, D and E, 1).

There are three ethmoidal turbinals (Plate II, Figures A, C, D, E, F and G, 2). They arise from the convex surface of the cribriform plate of the ethmoidal bone, and at first consist of a mass of thin, delicate and curved branches which intertwine with each other and almost completely fill the posterior superior part of each fossa (Plate II, Figures G, 2). As these branches extend anteriorly, they decrease in number and present broader and less convoluted surfaces (Plate II, Figure F, 2). The ethmoidal cells are cavities contained within these broader branches or between these branches and some of the surrounding bones of the skull (Plate II, Figure F, 7). The frontal sinuses are comparatively small cavities between the plates of the frontal bones and are partially filled by scrolls of the ethmoidal turbinals.

The maxillary sinuses are large cavities in the superior maxillary bones (Plate II, Figure F, 6). Their ostia are situated in the posterior part of each cavity and open into the nose in conjunction with some of the ethmoidal cells. Some processes of the ethmoidal turbinals extend into the maxillary sinuses.

In the deer, the accessory sinuses are more circumscribed and more definitely separated from the rest of the nasal fossae than they are in the kangaroo, but the sinuses all contain ethmoidal turbinal tissue and are a part of the olfactory portion of the nose.

Prairie Wolf (Canis latrans).

The wolf's nose is more highly developed than the nose of

the kangaroo or the deer. The turbinals are all much more complicated and their branches are more numerous and convoluted so that the inspired air is brought in contact with a tremendous expanse of mucous membrane.

The anterior half of each nasal fossa is almost completely filled with the fine branches of the maxillary turbinal (Plate III, Figures A and B, 1). The lateral wings of the vomer divide the posterior portion of each nasal fossa into an olfactory and respiratory part as in the kangaroo and the deer (Plate III, Figures A, C and D, 17).

In each fossa there are seven ethmoidal turbinals radiating from the convex surface of the cribriform plate and their delicate intertwining scrolls form a dense labyrinth in the olfactory part of the nose (Plate III, Figures A, C and D, 2). They articulate with the lateral wings of the vomer, the superior maxillary, frontal and nasal bones.

The maxillary sinus (one in each fossa) is an irregularly oval cavity between the ethmoidal turbinals and the superior maxillary bone (Plate III, Figures C and D, 11). Its posterior part is entirely shut off from the nasal fossa by the ethmoidal bone but anteriorly it is only partially separated from the nose by some scrolls of the ethmoidal turbinal. It acts as a channel to conduct some of the inspired air over the external lateral surface of the olfactory turbinals and thus produces a keener sense of smell. It is therefore, a part of the olfactory portion of the nose.

The ethmoidal cells are irregular spaces between the ethmoidal turbinals and the surrounding bones of the skull and contain scroll-shaped branches of the ethmoidal turbinal which spring directly from the cribriform plate (Plate III, Figure A, 4),

There is one frontal sinus in each half of the skull. It is an irregular cavity between the two plates of the frontal bone (Plate III, Figure A, 6). Anteriorly it communicates directly with the ethmoidal cells and contains a double coil of the ethmoidal turbinal.

The sphenoidal sinus is simply a slight depression in the anterior part of the sphenoidal bone and is filled by an ethmoidal turbinal scroll.

All the accessory sinuses of the nose in the wolf are therefore a part of the olfactory portion of the nose and all contain olfactory turbinal tissue. Their function is to conduct

the air over a part of the olfactory turbinals which would not be otherwise directly exposed to the inspired air, and thus increase the acuteness of the sense of smell.

Apes. Indian Ape (Macacus rhesus).

The ape's nose is a very much degenerated structure. The maxillary turbinal is a slightly curved bone and is very similar in outline and position to the corresponding turbinal in man (Plate IV, Figure B, 1). There are two ethmoidal turbinals in each fossa (Plate IV, Figures A, B and C, 2 and 3). The larger one projects downward and forward from the ethmoidal bone and divides into two branches (Plate IV, Figures A, B and C, 2). The smaller one is more scroll-shaped but both of these turbinals have lost the numerous, fine, convoluted branches which are present in lower animals, and the other ethmoidal turbinals (third, fourth and fifth) have entirely disappeared.

The maxillary sinus is situated within the maxillary bone and opens into the middle meatus through a small ostium, considerably above the floor of the sinus. Its walls are smooth and it contains no ethmoidal turbinal tissue (Plate IV, Figures A, B and C, 10). The other accessory sinuses of the nose have disappeared completely and the space which they occupied in the frontal and sphenoidal bones in lower animals, is filled with cancellous bone.

Gibbon or long-armed Ape (Hylobates).

The gibbon's nose is less degenerated than the nose of many other apes. The maxillary turbinal has a double coil (Plate V, Figures A, B and C, 1). There are two well-defined ethmoidal turbinals (Plate V, Figures A, B and C, 2 and 3), and three small ethmoidal cells. The maxillary sinus is comparatively large and communicates with the nasal fossa through a small ostium, high up in the middle meatus (Plate V, Figures B and C, 10). The sphenoidal sinus is very large and opens into the superior meatus through a small ostium (Plate V, Figure A, 6). There are no ethmoidal turbinals in the maxillary or sphenoidal sinuses. The frontal sinuses are absent and in their place there is cancellous bone.

In apes, as a class, all the turbinals have degenerated and show a comparatively simple structure. The accessory

sinuses present numerous variations. The maxillary sinus is always present and usually has smooth walls and a small ostium opening into the middle meatus. In some of the lower orders of monkeys, the ostium remains quite large and a small branch of the ethmoidal turbinal projects into the sinus.

The frontal sinus is present in the chimpanzee. In other apes it is absent and the frontal bone is cancellous.

The ethmoidal cells vary greatly in size and number. In some apes, there are none and the ethmoidal turbinals are very rudimentary. In others, there are several ethmoidal cells and the ethmoidal turbinals are not so much degenerated as they are in the apes, which have no ethmoidal cells. The variations in the sphenoidal sinuses are similar to those in the ethmoidal cells. In those apes in which these sinuses are absent, the ethmoidal turbinals are more degenerated and the ethmoidal cells are also absent.

Man.

The general characteristics of the accessory cavities of the nose in man are well known. They present numerous variations, many of which are reversions to more primitive types. The absence of one or both frontal sinuses corresponds to the absence of these sinuses in most apes. The ethmoidal sinuses are cells surrounded by some of the numerous branches of the ethmoidal and adjacent bones and occasionally contain small ethmoidal turbinal scrolls, as they always do in such animals as the wolf. The subdivision of one or both sphenoidal sinuses into two or more cavities corresponds to a similar division of these sinuses in some of the lower animals in which the ethmoidal turbinals extend into the sphenoidal sinuses and produce numerous subdivisions. The irregular ridges sometimes seen on the lateral walls of the maxillary sinuses are probably rudiments of the ethmoidal turbinals which extend directly into the sinuses in some animals, and in certain species are attached to the sinus walls.

The accessory sinuses in the lower animals are developed, therefore, in connection with the olfactory portion of the nose. They are rather simple channels which conduct some of the inspired air over the external lateral surfaces of the olfactory turbinals.

In animals which have an acute sense of smell, the olfactory (ethmoidal) turbinals exhibit a tremendously intricate development and the accessory sinuses are correspondingly more highly developed, and all of them contain olfactory turbinal tissue. Their function is to conduct the inspired air more directly over a large surface of the olfactory turbinals, which would not otherwise be exposed to the air except by diffusion, and thus the accessory sinuses increase the acuteness of the sense of smell.

In those animals in which the sense of smell is not acute, the olfactory turbinals have degenerated and receded from the accessory cavities. The cavities are left with comparatively smooth walls, their openings into the nasal fossae contract and their functional activity is lost.

In man the accessory cavities are almost completely shut off from the nose, their functional activity ceases, and they remain as rudimentary structures.

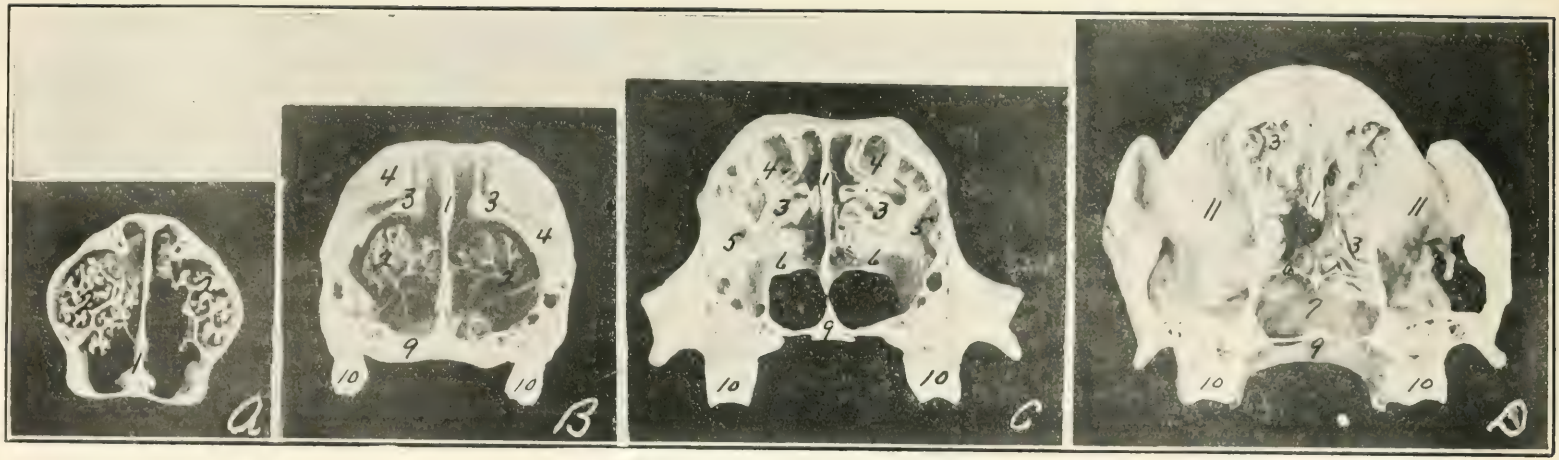


PLATE I KANGAROO (Macropus).

Transverse sections through a kangaroo's skull, showing both nasal fossae. A and B, looking anteriorly; C and D, looking posteriorly.

1. Nasal septum.
2. Maxillary turbinals.
4. Ethmoidal sinuses.
5. Maxillary sinuses.
6. Lateral wings of vomer.
7. Respiratory tract in the posterior inferior part of the nose.
8. Cribriform plate of the ethmoidal bone.
9. Palate.
10. Teeth.
11. Orbit.

PLATE II DEER (Cervus).

A, the left nasal fossa of a deer. B to G, transverse sections through both nasal fossae of a deer. B, D, E, F and G, looking posteriorly. C, looking anteriorly.

1. Maxillary turbinals.
2. Ethmoidal turbinals.
3. Brain cavity.
4. Posterior nares.
5. Septum.
6. Maxillary sinus.
7. Ethmoidal cells.
8. Palate.
9. Teeth.
10. Orbit.
11. Lateral wings of vomer.

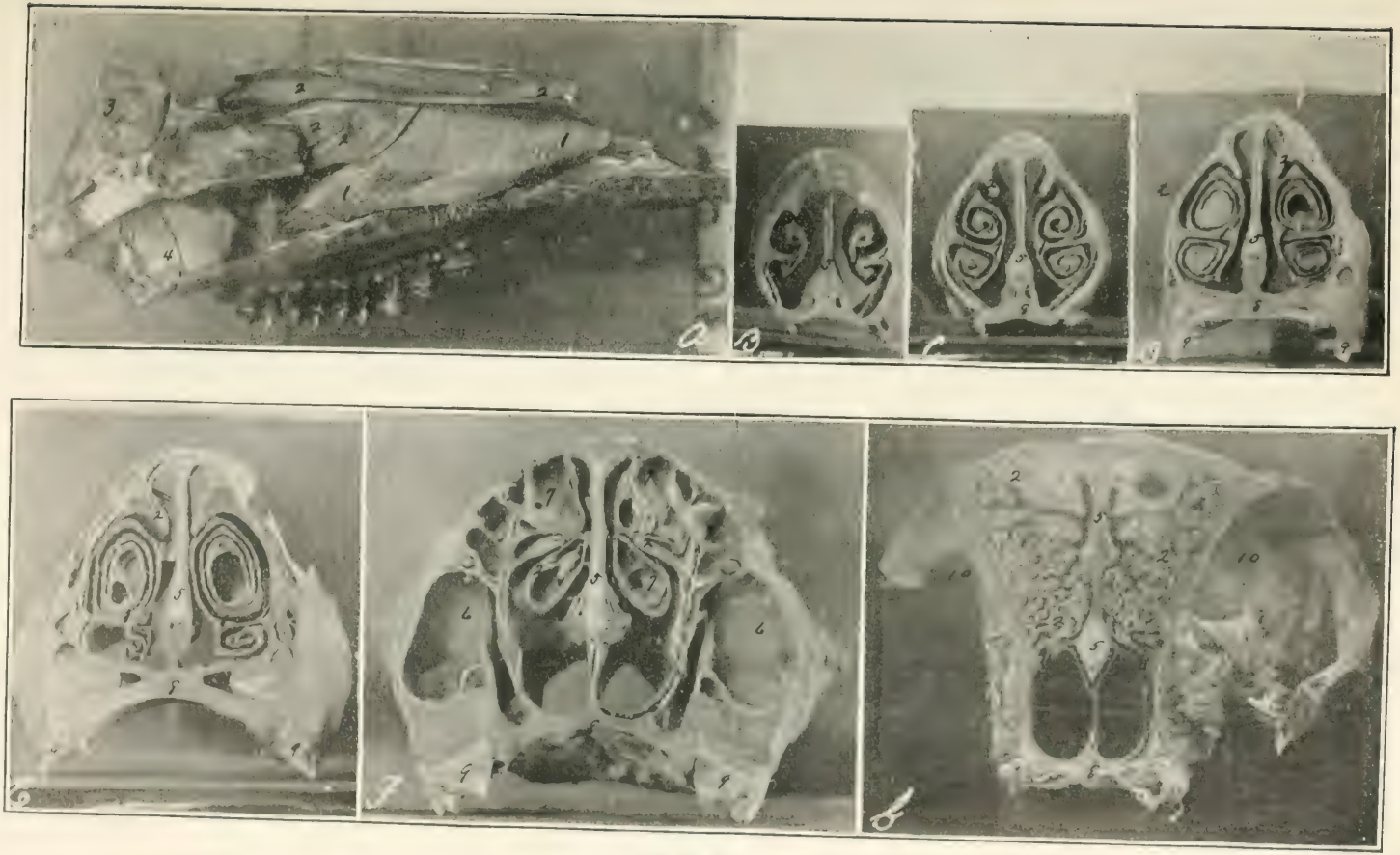


PLATE II

PLATE III. PRAIRIE WOLF (Canis latrans).

A, longitudinal section through a wolf's skull, showing the right nasal fossa. B, C and D, transverse sections through a wolf's skull showing both nasal fossae. B and C, looking anteriorly; D, looking posteriorly. (In Fig. B, the nasal septum is absent, having been lost in maceration.)

1. Maxillary turbinal.
2. Ethmoidal turbinal.
3. Ostium maxillare.
4. Ethmoidal turbinal in ethmoidal cells.
5. Ethmoidal turbinal in frontal sinus.
6. Frontal sinus exposed by removing its internal wall.
7. Cribriform plate.
8. Ethmoidal turbinal in sphenoidal sinus.
9. Brain cavity.
10. Posterior nares.
11. Maxillary sinus.
12. Ethmoidal turbinal extending into the maxillary sinus.
13. Orbit.
14. Palate.
15. Teeth.
16. Vomer.
17. Lateral wings of vomer.
18. Septum.
19. Respiratory tract in the posterior inferior part of the nares.

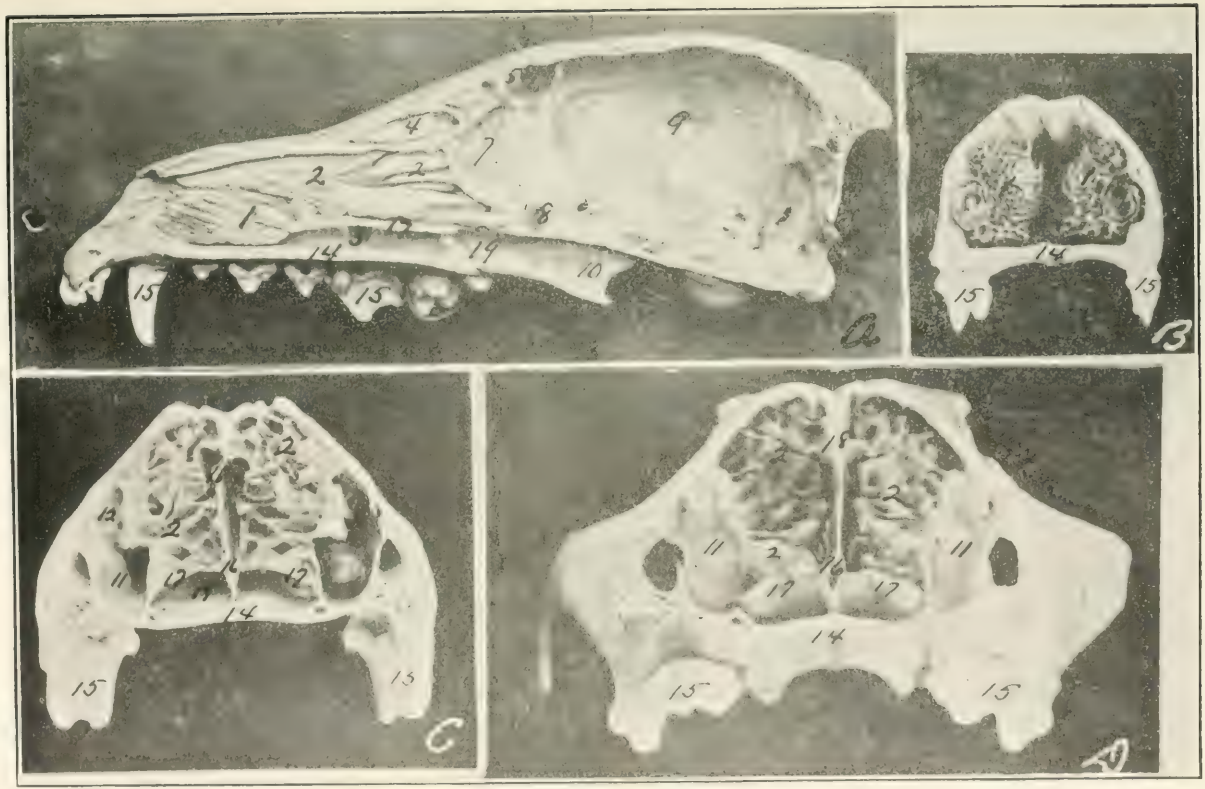


PLATE III.

PLATE IV. INDIAN APE (Macacus rhesus).

A, longitudinal section through ape's skull, showing the left nasal fossa. B and C, transverse section through the right nasal fossa of an ape. B, looking anteriorly: C, looking posteriorly.

1. Maxillary (inferior) turbinal.
2. Ethmoidal (middle) turbinal.
3. Ethmoidal (superior) turbinal.
4. Cribiform plate of ethmoidal bone.
5. Cancellous frontal bone.
6. Cancellous sphenoidal bone.
7. Palate.
8. Brain cavity.
9. Teeth.
10. Maxillary sinus.
11. Orbit.
12. Nasal septum.

In Fig. A, the maxillary turbinal has been lost in maceration and the maxillary sinus (10) is exposed.

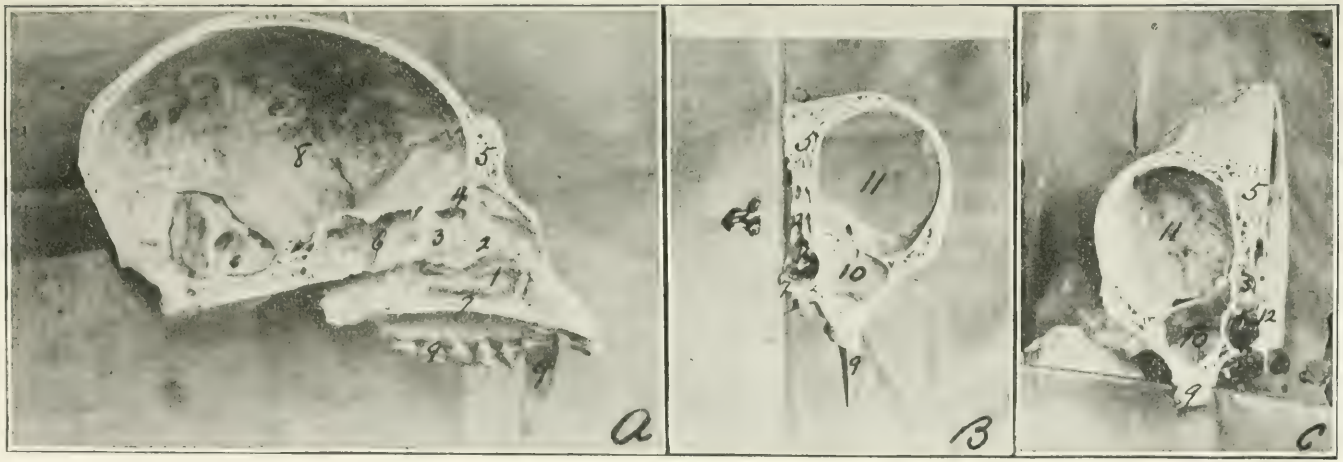


PLATE V. GIBBON (Hylobates.)

A, longitudinal section through a gibbon's skull, showing the left nasal fossa. B and C, transverse sections through the right nasal fossa of a gibbon. B, looking anteriorly; C, looking posteriorly.

1. Maxillary (inferior) turbinal.
2. Ethmoidal (middle) turbinal.
3. Ethmoidal (superior) turbinal.
4. Cribriform plate of ethmoidal bone.
5. Cancellous frontal bone.
6. Large sphenoidal sinus.
7. Palate.
8. Brain cavity.
9. Teeth.
10. Maxillary sinus.
11. Orbit.
12. Nasal septum.

PAPER:

THE NASAL TURBINATE AS A VASO-MOTOR INDEX.

JAMES A. BABBITT, M. D.,

The responsibility for physical examination in adolescence, whether general or of special senses, affords much difficulty in the determination of reliable basis for judgment. On purely morphologic lines, such standards may be readily found, and questions of defects in symmetry and posture are easily settled. Again, examination of heart, lungs and gross abdominal organs as to functional and organic integrity is comparatively simple, and in the special senses as well, gross organic defects of eye, ear, nose and throat are quickly recognized and recorded.

Aside, however, from the mere basis of cautionary advice and records of statistical and anthropometric value, many questions of vast, underlying importance rest in the examiner's estimate of the individual before him. In view of the wide variation even in the normal type, this becomes particularly difficult. The vital question at once arises as to what really constitutes a true type of bodily health. What factors add to best results, and favor general bodily metabolism; what influences lead to most natural and favorable vaso-motor action? Is this individual, and are these special senses, more or less widely differing in formation, nervous reaction, and physiologic activity, in a strictly healthy condition? If doubtful, which is cause and which effect, and where shall the foundation deficiency be located.

Laying aside the general physical problem and confining ourselves to the physical examination of certain special senses, the topic of the paper presents a field of much interest. The term catarrh, in common consideration, is inseparably connected with the nose, throat and ear, though perhaps wrongly so. Yet in spite of this limitation, it presents a wide field of correlated influence, both in its relation to the general lithemic and uric acid problem, and also involving as it does a most

typical erectile surface, and performing its function as a body representative of vaso-motor change in its relation to this general system. It is the importance of this phase in general examination of the special senses, and its significance in the general bodily economy, which seem to warrant its choice for study.

Consider it, too, if you will, in its significance as to the physical condition of the growing child. First, it will be generally conceded that the catarrhal condition wherever found is a most important factor in its influence upon metabolism; secondly, the nasal mucous membrane, particularly the turbinates, are quickly affected by all special sense catarrhs. Let us consider how far, then, their condition is indicative of vital condition.

The vaso-motor system, as its name implies, includes that vast ramification of constrictor and dilator nerve fibers distributed to the muscular coats of the vessel walls, which from direct and reflex impulses practically control the action of all vital processes. Retarded blood supply practically inhibits vital activity; excessive supply produces congestion with similar retrograde results.

Starting from the vaso-motor center in the bulb, with subsidiary centers in the cord, passing out through the sympathetic system, and closely ramifying with the branches of the pneumogastric, this system of vascular nerves is practically the system in control of organic life. Furthermore, stimulation in this tract, of more than functional significance, directly produces pathologic result, evidenced by the gangrene of permanent constriction and degeneration of epithelial surfaces, following permanent dilatation.

As the functional activity of the vaso-motor system is practically limited to the arteries and capillaries, its changes are freely exhibited, and the lightning-like rapidity by which the weight of the body is changed in each consecutive moment shows its potent force. Pallor and blushing of the skin, change in surface temperature, modification in volume, rhythm and pressure of surface pulse, sensory phenomena in great variety, are all vaso-motor in result if not in origin.

Granting then, this vast underlying physiologic system, intangible and undemonstrable in accurate measure, yet perfectly in control of all organic life, it is then but fair to give this ele-

ment a crowning place in the controlling mechanism of the special sense organs, which though possessing individual sensory apparatus, are yet dependent to a last degree on the general vascular mechanism for their integrity. The body economy is so perfectly correlated in all its parts, and both section and elimination so seriously affect parts most distant from those in action, that local indication of systemic influence may be safely considered. It is the purpose here to determine then, how far in a special sense physical examination, such as that of the nasal turbinates, can indicate condition of general vaso-motor action, and in this case the nasal mucous membrane is selected simply as a particularly representative vascular tissue.

In a series of diagnostic physical examinations of nasal cavity and naso-pharynx, we are probably most forcibly impressed with the turbinated features. Such examination, of course, includes careful estimate of septum, floor surface, vibrissae, superior, middle and inferior turbinates, and pharyngeal tonsil with perhaps added illuminated investigation of sinuses.

From a purely operative standpoint, possibly the condition of the septum might stand paramount, and this perhaps is seldom strictly normal, but in general judgment of the nasal cavity, and its ability to perform the functions, olfactory, respiratory, phonatory, and protective, which nature has assigned it, we study the turbinates with increasing respect.

To the novice, this routine and judgment seems trivial, but with more experience there comes with rude shock the realization of how many nasal cavities, condemned in our judgment, really afford but slight disturbance to the patient, and on the other hand of how many apparently trivial abnormalities and hypertrophies afford him genuine distress.

The subject wil be carried on in these phases: (A) Classification. (B) Anatomy. (C) Group tests and statistics (D) Deductions.

(A) Rhinitis, or more properly speaking, rhino-pharyngitis, has been broadly grouped in the following classification:

a. Simple rhinitis,
b. Hypertrophic rhinitis,
c. Atrophic rhinitis,
d. Sclerotic rhinitis (sequence of b),
e. Purulent rhinitis (sequence of c),
f. Vaso-motor conditions,
g. Specific and membranous affections,
h. Invasion of foreign bodies.

This classification, admirable in many respects, is confusing in that both hypertrophic and purulent may be specific in origin; again, the vaso-motor element, prominent in the first four groups, may still be first to reveal the presence of the foreign body; indeed, often baffled alike are both experienced practitioner and immature specialist in the diagnosis and therapeutics afforded by the complex walls of the nasal chamber. Add to this the cause and effect presented by a much convoluted and distorted septum, and the confusion is complete.

In our consideration, it is but fair to admit these difficulties; so misleading is the appearance of the nasal cavity, so frequently do gross turbinate processes produce no discomfort, and on the other hand roomy nasal passages afford such scant relief, and again so moderate are the changes sufficient to produce major obstruction, that over-reliance on surface indication is as fatal as underestimate of the same.

(B) On gross anatomy and accidental deformity, but little need be said, and passing by nasal deflection, of course a frequent cause of all the difficulty present and remediable by surgical intervention only, a nasal study naturally devolves into a consideration of the turbinated structures, the upper two springing from the inner walls of the ethmoid bone, and the lower independent, protecting the opening into the antrum of Highmore and overlapping the floor of the proper nasal passage.

In studying their structure, connection with the cerebral and sympathetic nervous system, tracing the etiology of quick vascular change and response to irritation, and again analyzing these laws of cause and effect in their relation to the adolescent period, we note firstly, that they present the most readily changeable and movable tissues in the nose, and are directly under influence of cranial and sympathetic nerves; secondly, are essentially vascular in their anatomy; thirdly, each protects openings to important sinus passages, and finally that together they perform in large part the total nasal function, both sensory and olfactory.

Anatomically (and here we must share their importance with the nasal septum) the turbinates consist of thin lips of bony shelving, curved in somewhat wood-shaving appearance, covered first by basic layers of fibro-elastic tissues in stroma containing nerves, lymphatic and glandular elements. Upon

this is a membranous layer, and it is outwardly covered with ciliated epithelium interspersed with goblet cells in the lower, respiratory portion, and by non-cilated epithelium mingled with special olfactory terminals in the higher, olfactory region. The nervous supply of special sense is through filaments of the olfactory nerve passing through the cribriform foramina, and that for general sensation is derived through branches of the fifth or trigeminal, through both ophthalmic and maxillary divisions. Branches from Meckel's ganglion and the vidian nerve practically complete the group. The vascular supply forms a vast communicating series, freely anastomosing in all parts, and comprised in the main of branches from the ophthalmic, internal maxillary and facial arteries.

This anatomic summary has been hastily and briefly given, as it but indirectly affects the topic, yet emphasizes the particularly important vascular and nervous relations. Due to this freely ramifying vascular supply, we find the nasal turbinates a typical erectile tissue, freely and quickly subject to vascular engorgement, if the return avenues for such congestion be temporarily closed.

Granting the above, we summarize this situation in the nasal picture as presented:

(a) A locality freely subject to vascular congestion from whatever cause.

(b) A hypersensitive vascular area open for free and serviceable study.

(c) A locality freely subject to metabolic change. In so far as these attributes be representative of vaso-motor influence, so far may they be considered indices of the same.

Clearly the period of life, varying as it does, in which hypertrophic, or as preferred by Dr. Kyle, hyperplastic, change has become well marked, and deformities in nasal position have produced irremediable organic defects, presents no opportunity for safe judgment, but in the earlier adolescent period, a far different status obtains. Here much is in the formative stage—an application of cocain or adrenalin reveals how largely the swollen turbinate structure can clear itself from true hypertrophic stigma.

Suppose such a subject in the formative period of life were to be under examination. Nasal chambers show passages largely blocked by enormous turbinates, and this in time asso-

ciated with general thickening of the entire nasal mucous membrane. By post-nasal mirror, we first attempt the elimina- of the enlarged pharyngeal tonsil. By speculum anteriorly we clear the suspicion of deflected and distorted septum, and its consequent points of pressure irritation. Polypoid degeneration and foreign bodies are next excluded, and the question of specific neuroses investigated by general symptomatology. By secondary, careful study we may perhaps eliminate true hyperplastic and sclerotic changes, and yet admit, that all these conditions are far from disassociated with the vaso-motor element, indeed, are most intimately connected with it, and must be given their place in such category.

With these functionally swollen turbinates before us still, after elimination of foreign obstruction, specific disease and misplaced septum, and reinforced by application tests of cocain and adrenalin, typical erectile tissue as it is, we have a vaso-motor focus of increasing interest and such causal possibilities as the following may present themselves in a rude way:

1. Acute rhinitis from known irritative cause. (This finally diagnosticated by accompanying symptoms.)
2. A general superficial vaso-motor dilatation from known cause and associated with vaso-dilatation throughout other parts of the body, such as blushing of the surface, frank perspiration, etc.
3. A possible evidence of general cerebral congestion.
4. A hypersensitive mucous membrane responsive to any suggestive influence encountered.
5. A congestive swelling closely following violent exercise.
6. A congestion periodic in its type.
7. Reciprocal congestion secondary to systemic illness.
8. Congestion due to disturbed metabolism.

This list might be extended, and many other vital conditions might show the metabolic relation to the general body economy. Inferences from these anatomic appearances are quickly and surely drawn.

(C) In the continuation of this topic, it having been the writer's privilege to be associated with much special and general physical examination, he would submit this preliminary report of conditions bearing upon this topic, not as conclusive in any degree, but as containing figures for further study and estimate.

In a small college near Philadelphia, a new form of physical examination and test was recently applied, one which had been recently suggested by Dr. Meylan, of New York, and in which, under a rather elaborate system, the following factors were taken into consideration: (a) Bodily control (series of four tests), one for upper extremities, one for lower, and two combined. (b) Vitality (a strictly endurance test). (c) Health (estimated one-half by examiner's grade assigned to general examination of heart, lungs and nervous system, and one-half by a series of fixed strength tests not involving co-ordination). This system certainly seems to be a rational one.

The opportunity had been previously taken to make special examinations of these same men as to condition of eyes, ears, nose and throat. Of these tests perhaps the most interesting was the vitality test taken under these conditions:

The candidate hung down between two parallel ropes with a known shoulder adjustment. To metronome accompaniment, once each second, he sprang to hanging position with hands opposite armpits, and then at next beat dropped to the floor, and continued this to exhaustion point. In observing these tests, fifty-one men at a given time took part, and as the age of the subjects was from 17 to 24, the sclerotic or hyperplastic turbinate was present to certain degree. Of these fifty-one men, fifteen by previous examination presented distinctly enlarged turbinates. Of this number nine men represented particularly free vaso-motor characteristics, and as to reaction time, seven would be considered of quick response, six moderate and three slow in type.

The results, meager as they are, may prove of interest, but, it is fair to admit, yielded nothing as conclusive as in tests to be described later.

Of the fifteen noted above as representing filled turbinated sacs:

1. In the special endurance test, nine were above and six below the group average.
2. In strength test, eight were above and six below.
3. In complete examination, bodily control (four tests), endurance and health (represented by physical examination and strength tests), nine were above the average and six below.

The general result then was rather in favor of men of acute vaso-motor type, but the number of candidates was too small for fair average, and the tests were non-conclusive.

A little over a year ago we made general and special examination of about 270 boys in a large boarding school near Philadelphia. Special note was made of all boys having deformed septa and enlarged turbinates.

Of this number (270), 52 were found possessing unusually large turbinates, and following the method above outlined, the writer has been investigating parallel conditions. Of this number, seventeen showed direct parallel conditions. Of this naso-pharyngeal obstruction, such as enlarged faucial and pharyngeal tonsils or thickened walls; eleven had marked manifestations of nasal septum deformity (deflection or spur).

This leaves twenty-four men who might be classified as under a more or less definite vaso-motor influence, though the first group may also in part be secondary to this. In fact, three more, one from constantly recurring autumnal catarrh, and two from general systemic disturbance, might be excluded from the classified list.

Taking then these two groups, Class a contained thirty-one with distinctly causative obstruction and Class b twenty-one rather clearly vaso-motor conditions. The following estimates resulted:

1. Nineteen were classified at the time of the examination as of particularly active nervous system, nine in Class a and ten in Class b, while all but six of the remainder were put in moderately active nervous group.

2. In reaction time of the entire group, twelve showed highest response and thirty-one moderate, leaving but nine of poor reaction period.

3. In vaso-motor examination such as blushing, perspiration, general superficial temperature changes, and possibly associated pilo-motor activity, twenty-four were marked positive with the larger proportion of the remainder in the medium list.

4. In heart examination, twenty-five were recorded as perfect, twenty-three of modified integrity with slight functional disturbance, such as, hemic murmurs, nervous palpitation, or temporary dilatation, and four with a slight organic defect, more or less pronounced.

5. In general health, twenty-six were marked good, twenty moderately good or fair, and six distinctly poor.

6. As a matter of interest the scholarship question was in-

vestigated with the result that thirteen were considered good students, twenty-three medium and sixteen poor, but this seems hardly in any way indicative.

Conclusions from the above evidence are of course merely tentative and unsupported by sufficient corroboration, and averages again far too meager. They are impressive, however, and in toto present sufficiently distinct correlations to grant some deduction.

In the above statistics it will be noted that only in the first group have Class a and Class b been distinctly differentiated, and in explanation it may be said that at the time of the examination the differentiation in the remaining classes, two to six inclusive, was not sufficiently clearly indicated for announcement in this paper, and also these latter groups are included in a larger computation to be taken up later.

It seemed best to the writer, therefore, to state the averages for the present time upon the gross number of cases reported, and to submit these results as a preliminary report.

(D) Possible conclusions from the above: Granting that in the nasal cavity we possess a most highly sensitized vascular erectile organ, and readily accessible to examination, this in the early period of life is particularly sensitive to vaso-motor influences, and apparently holds a coordinated relation to general vitality and offers assistance in the gauging of metabolic change.

To substantiate this, other vaso-motor tests may be applied. A search into the general life and history of the individual indicated by these local examinations may reveal much of neurotic influence; the influence of sympathetic changes in abdominal physiology may possibly be found; again this may prove the key for the detection of associated sexual excess, or even may reveal the reflex vital disturbance from sexual irritation of deformity. In fact, redirection of the subject's entire life might in remote cases be a providential leading from studies of vaso-motor changes.

It would be unfair and foolish to place too much credence on diagnosis by isolated symptoms, yet in the search for truth we seek to attain all safe landmarks and directions leading to permanent health, and assign to that term its best and highest sense.

To the true diagostician, brawny muscular development,

powerful hypertrophied heart, hypersensitive motor and sensory nerve reaction do not mean health, but far more those latent qualities of clear eye ground, soft, velvety skin, normally vascular and undisturbed mucous membranes, resilient muscular action, regularity of all secretions and excretions, deep, clear respiration, a pulse regular in volume, rhythm and vis-a-tergo cardiac pressure, indicative of strong valvular action.

Deranged vaso-motor responses are imperative, and herein lies the value of vaso-motor evidence. Its advisory indications will be both prohibitory and stimulative.

This paper is presented without apology as a preliminary report, holding no claims but those of suggestion, and it is most respectfully added to the accumulation of contemporary testimony.

PAPER:

SKIAGRAPHY IN THE DIAGNOSIS OF FRONTAL SINUSITIS.

W. A. Chisholm, M. D.,

At the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, February, 1905, Dr. C. G. Coakley read a paper on the above mentioned subject. Basing his observations on forty-four skiagraphs which he had taken up to that time, he arrived at certain conclusions. One of these (the third) was as follows (*Annals of Otology, Rhinology and Laryngology*, March, 1905):

"In all cases of unilateral disease of the frontal sinus, verified by operation, we have observed a cloudiness in part or all of the area occupied by the sinus, and an indistinctness in the outline of the cavity when compared with the opposite or healthy side."

In its account of a discussion on the same subject at the Annual Meeting of the Association in June, 1905, the October number of the *Laryngoscope*, page 810, reports a distinguished member as expressing the following views:

"In regard to skiagraphy he said it was a very beautiful and instructive method of demonstrating the size of the frontal sinuses and their relation to one another, but he doubted the statement made by one of the speakers that it showed diseased conditions of the sinuses. He did not believe that the X-rays demonstrated the diseased sinuses in any way, shape or manner."

By the introduction of some skiagraphic prints later on, I shall endeavor to show that this is an erroneous opinion, which, I believe, could be arrived at only by studying an insufficient number of plates, or those that were inferior. In unilateral disease of the sinus, good plates show in varying degree, the characteristic differences specified in the first quoted paper.

The reason why the normal and diseased sinuses should present different appearances in the plate had not been defi-

nitely determined. Increased thickening of the mucous membrane, fluid contained in the cavity, changes in the bone, were all advanced as possible causes. The following experiments and deductions are the result of Dr. Coakley's suggestions to me that I try to determine the cause.

As I knew little or nothing about X-ray work, I applied to Dr. E. W. Caldwell, Director of the X-ray Laboratory at the University and Bellevue Hospital Medical College, for assistance. He kindly complied and to his skill I attribute any success that may have attended our efforts.

Mucous membrane was the subject of our first investigation. We desired to ascertain whether the shadow cast by a moist membrane differed from that of a membrane which had been previously dried. Two portions were taken from intestine, one of which was kept moist, the other spread on a thin board and carefully dried by means of an alcohol lamp. They were then X-rayed, side by side. Of the resulting skiagraphs Figs. I, II, III and IV are presented.

One end of each portion of the membrane was spread out flat, represented by (A), while the other end of each was folded on itself twice, thus giving three thicknesses at that part (B). This was done to aid comparison if the shadows were to prove very faint. In the prints the moist portion of one thickness (A) shows in Figs. 1 and 3 a deep shadow, markedly accentuated in the part folded upon itself (B). The dry portion, on the other hand, is scarcely visible in Figs. 2 and 4, in the section where there was one thickness (A), and the picture is not much more distinct in the part where there were three thicknesses (B). One can deduce from this that it is the moisture in the membrane that deepens the shadow.

Our next experiment consisted in determining whether pus or other fluid in a cavity cast a shadow in the radiograph different from that cast by a cavity filled with air. For this purpose empty gelatine capsules were selected. No. 1 was left empty, No. 2 filled with pus, No. 3 filled with saline solution and No. 4 filled with blood. Some difficulty was experienced on account of the softening of the capsules on introducing the fluids. As a consequence, the capsules containing pus (No. 2) and blood (No. 4) were not completely filled and a strip of adhesive had to be employed to retain them in position. Two

exposures were taken, the first lasting one second, Fig. 5, the other lasting two seconds, Fig. 6.

In the prints presented, Figs. 5 and 6, the capsules containing the pus, saline solution and blood, Numbers 2, 3 and 4 respectively, cast deep shadows of practically equal intensity, while the outline of the capsule filled with air (No. 1) is barely discernible. The wavy band along the lower half of the capsules represents the adhesive. The bubbles of air in the pus and blood (Nos. 2 and 4) show very distinctly. These air bubbles, obtained by accident, proved a very valuable aid to us, showing that cavities filled with air cast a much lighter shadow than those filled with fluid.

The next step was to fill an empty frontal sinus with pus or something equivalent to it, and observe the change effected in the plate. Saline solution was chosen as it could be more easily handled than pus. As the fluid could not be introduced through the fronto-nasal duct, an incision was made over the sinus, and the bone exposed. With a small trephine an opening was made into the sinus, the cavity was filled and the button of bone and soft tissues replaced. It was found, however, that although efforts were made to plug the fronto-nasal duct, the fluid leaked out before a satisfactory plate could be obtained. It was decided that it was a matter of some difficulty to get fluid to remain in the cavity. Some substance that could be introduced as fluid so as to fill all parts, then solidify so as not to escape was required. It was essential also that it should cast the same shadow as pus. Gelatine was suggested and it was determined to try it.

First it was necessary to find what it showed on being X-rayed. As the capsules in the other experiment did not answer the purpose perfectly, a new method of comparison was instituted. A piece of hard rubber, six inches long, one inch wide and one-half an inch thick was secured. Six holes, 5/8 of an inch in diameter, were bored through it. A thin strip of gutta-percha was laid on the bottom and fastened to it with bicycle cement; this would not interfere with the rays. There were thus six receptacles of the same size and shape. Into No. 1 two c.c.'s of gelatine which became firm directly was placed. Into No. 2, two c.c.'s of pus was dropped. Into No. 3, blood to the same amount was introduced. Into No. 4, saline solution and into No. 5, water was placed—the fluids in each case

being dropped from a measured pipette. No. 6 was left full of air. An exposure of one-half second was made (Fig. 7) followed by another lasting one second (Fig. 8).

The prints show in both figures the gelatine (1), pus (2), blood (3), saline solution (4) and water (5) displaying well marked shadows which appear to be identical in intensity, while the sixth (air) is clear. Judging from the shadows cast on these plates by the various substances, gelatine was equivalent to pus in casting a shadow.

Another head was secured which had previously been kept dry, so that no fluid would get into the sinuses. A radiograph was taken in order to map out the frontals. An incision was then made through the soft tissues beginning at a point a little outside the external angular process, extending up to the hair line, then horizontally and down to a corresponding point on the other side. The periosteum was peeled down below the supra-orbital ridge. With the first plate as a guide, four holes ⅛ of an inch in diameter were drilled into the upper margins of the sinuses so that in filling no air-bubbles would remain. The cavities were found dry and membranes normal. The soft tissues were then replaced and a second plate taken (Fig. 9).

This showed the right sinus apparently completely divided into two nearly equal parts by a bony septum and the left partially divided. The outlines were well defined, and the sinuses appeared normal. The openings made by the drill were visible. Gelatine was dissolved in hot water and cooled until it became syrupy; a syringe holding a dram, with a needle ⅛ of an inch in diameter so as to exactly fill the drill hole, was filled with the thickening gelatine. It was then allowed to cool still further until some little effort was required to expel its contents. The left side was selected for the injection. It seemed very capacious, requiring four syringefuls to fill it. A good deal of pressure was exerted in order to completely fill the same. The soft tissues were again placed in position and a final plate taken. The exposure was the same as in the other cases—thirty seconds.

The print of this last skiagraph shows what looks to be the whole left, and inner half of the right sinus, clouded and fogged with the outline very indistinct—an appearance identical with that shown in a diseased sinus. What appears to be the outer half of the right sinus up to the bony septum dis-

plays the appearance it previously presented. The real condition was disclosed by subsequent examination. The true septum dividing the sinuses was not in the median line, but was the one which appeared to be near the middle of the right sinus and showed complete in the first plate. Thus was produced a very large left sinus and a correspondingly small right one. An incomplete bony septum was found in the median line being defective in the lower end. No regret was felt that this condition existed as it rendered the picture all the more interesting.

For the sake of comparison I present prints of several skiagraphs showing diseased frontal sinuses. For these I am indebted to Dr. Coakley, who has kindly loaned them to me for this purpose.

Fig. 11 shows the right sinus clear and distinct, the left cloudy and indistinct. The print in this case does not represent the difference as clearly as the plate does. Operation revealed a sinus full of secretion but the mucous membrane was not perceptibly thickened. The trouble was largely obstructive, as the bottom of the fronto-nasal duct was so constricted that a small sized probe could not find an outlet into the nasal cavity. Here we have a nearly normal mucous membrane and a cavity filled with fluid. This agrees with the gelatine experiment.

Fig. 12 is very similar to the one shown of the sinus filled with gelatine. Here in the same way the left sinus extends far beyond the median line, rendering the right correspondingly small. The large left sinus shows hazy and dim in outline. Operation revealed greatly thickened membrane and pus in the left.

In this case transillumination and other evidences pointed to double frontal sinusitis. As complete confidence had not at that time been established in skiagraphy, an exploratory operation was performed on the left side. A dilatation of the infundibulum was revealed but no sinus in the vertical portion of the frontal bone, although exploration was thorough.

In conclusion: While no print can show the diseased condition as plainly as the original negative, these that have been presented distinctly show the difference between the normal and diseased sinuses, and I believe the value of the skiagraph as an aid in diagnosis of these conditions can scarcely be overestimated.

As a result of our experiments I think it may fairly be concluded that the characteristic appearance of a diseased sinus is due to the fluid contained, whether it be free in the sinus or contained in the thickened, edematous membrane.

The necessity of good skiagraphs cannot be insisted upon too strongly. A poor skiagraph may be sufficient to determine the presence or absence of a sinus and possibly the number and situation of the septa without being of any assistance in determining the presence or absence of disease.

As in other methods of diagnosis, the skilled observer notices changes which would escape the observation of a less practiced eye.

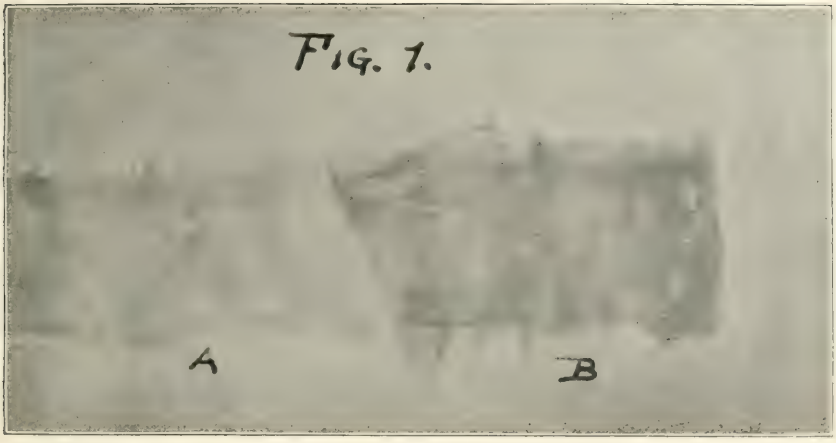


Fig. 1.—Skiagraph of moist intestinal mucous membrane. A—One thickness. B—Three thicknesses. Time of exposure, one second.

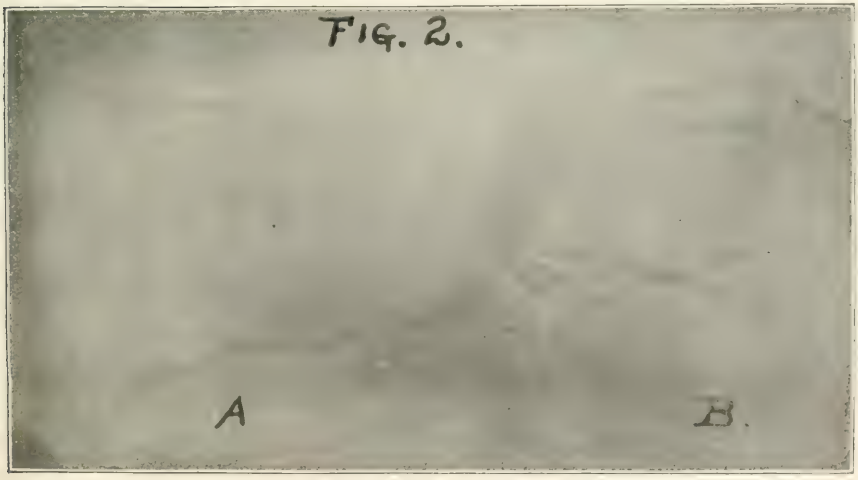


Fig. 2.—Skiagraph of dried intestinal mucous membrane. A—One thicknesss. B—Three thicknesses. Time of exposure, one second.

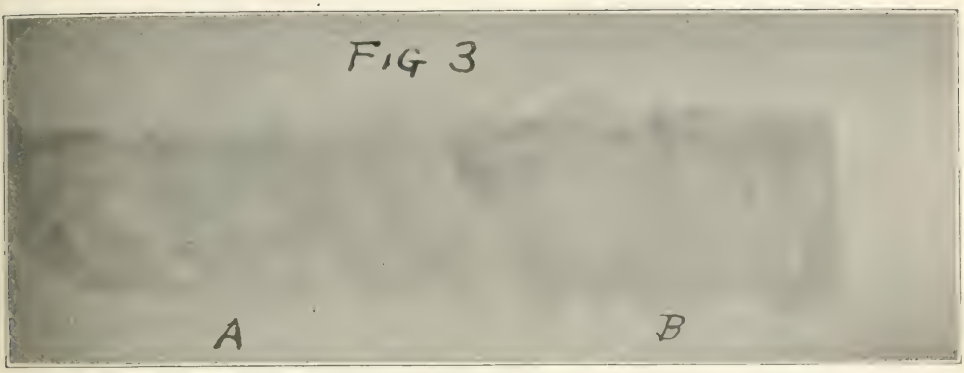


Fig. 3.—Skiagraph of moist intestinal mucous membrane. A —One thickness. B—Three thicknesses. Time of exposure two seconds.

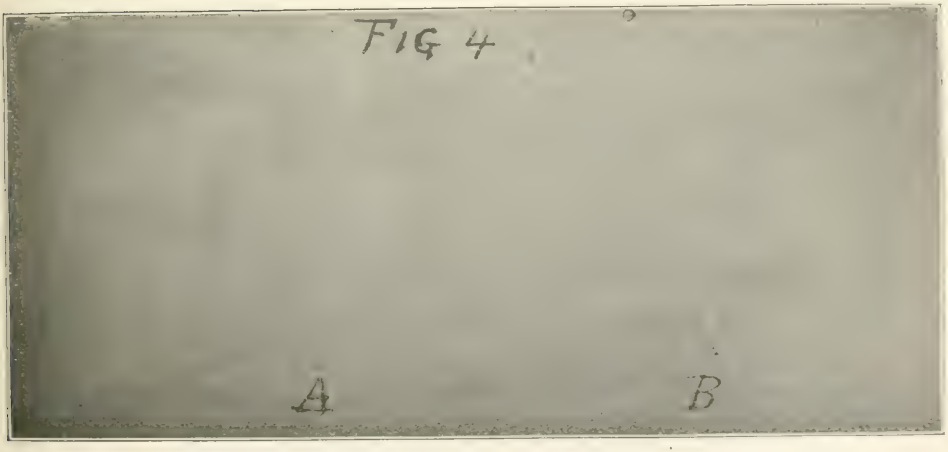
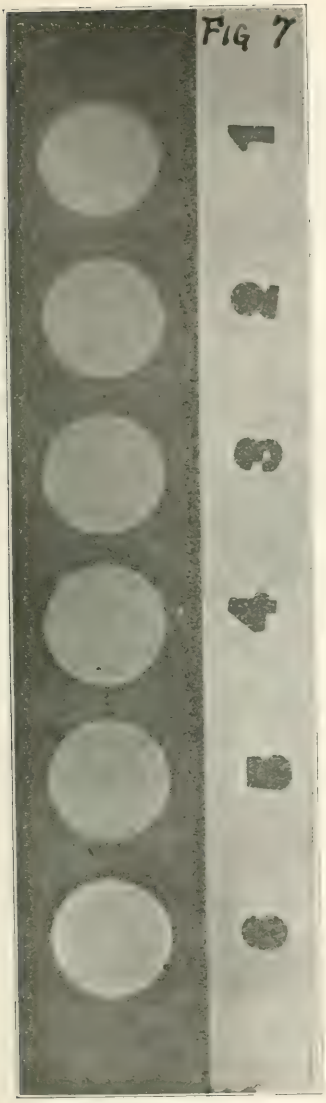


Fig. 4.—Skiagraph of dried intestinal mucous membrane. A—One thickness. B—Three thicknesses. Time of exposure two seconds.

Fig. 5—Skiagraph of gelatine capsules containing (1) air, (2) pus, (3) saline solution, (4) blood. (2) and (4) show bubbles of air. Wavy band is strip of adhesive. Time of exposure one second.

Fig. 6.—Skiagraph of gelatine capsules containing (1) air, (2) pus, (3) saline solution, (4) blood. (2) and (4) show bubbles of air. Wavy band is strip of adhesive. Time of exposure, two seconds.



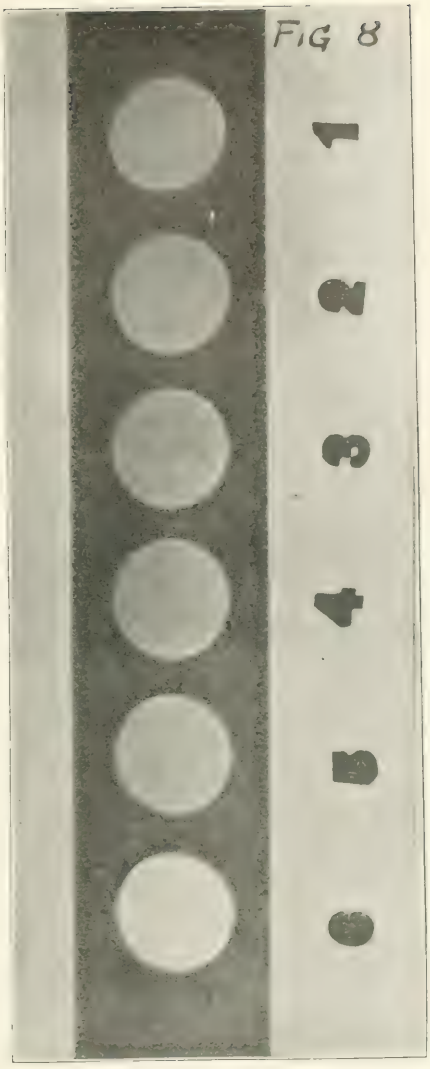


Fig. 7.—Skiagraph of receptacles in hard rubber, each containing two cc.'s of (1) gelatine, (2) pus, (3) blood, (4) saline sol., (5) water, (6) air. Time of exposure one-half second.

Fig. 8.—Skiagraph of receptacles in hard rubber, each containing two cc.'s of (1) gelatine, (2) pus, (3) blood, (4) saline sol., (5) water, (6) air. Time of exposure one second.

Fig. 9.—Skiagraph of head showing normal frontal sinuses, except that true bony septum is situated in what appears to be the middle of right sinus. Afterwards employed for gelatine injection. Time of exposure 30 seconds.

Fig. 10.—Skiagraph of head (represented in Fig. 9), showing large left frontal sinus filled with gelatine; small right sinus shows normal. Large left sinus extending far beyond median line is clouded and outline in distinct giving appearance identical with that of diseased sinus. Time of exposure 30 seconds.

Fig. 11.—Skiagraph of head, showing right frontal sinus normal, left diseased. Verified by operation.

Fig. 12.—Skiagraph of head, showing small right frontal sinus normal; large left sinus extending far beyond median line is diseased. Verified by operation.

Fig. 13.—Skiagraph of head, showing right frontal sinus normal, left diseased. Verified by operation. Septum slants towards left.

Fig. 14.—Skiagraph of head, showing normal left sinus, right sinus diseased extending beyond middle line and high up. Verified by operation.

Fig. 15.—Skiagraph, showing frontal probe introduced into left frontal sinus. Right does not show having been previously operated upon, and obliterated by granulation tissue.

Fig. 16.—Skiagraph, showing absence of frontal sinuses.

PAPER:

CARCINOMA OF THE LARYNX—OPERATION AND SPECIMEN.

CHARLES W. RICHARDSON, M. D.,

On the sixteenth of January, a gentleman, 72 years of age, was brought to me for examination. He had been continuously hoarse for a period of six months. Previous to this hoarseness, there were six months in which the voice had been altered from time to time. The voice was raw, presenting the voice characteristics of a tuberculosis. The patient's general history was most excellent.

Present status: Apparently a strong, healthy man, of medium height, well nourished, slight pallor of the skin, nervous and excitable. Examination of the neck externally showed no enlarged glands; nose and pharynx normal. Examination of the larynx showed a growth involving and affecting the anterior two-thirds of the left vocal cord, and extending slightly and apparently beyond the commissure to the other side. It was interesting to note that this patient never complained of spontaneous pain or any painful sensations after talking. Diagnosis was made of cancer of the larynx and the patient so informed. Procedure to be adopted was left open to the patient, he being told of the various methods of treatment. After about three days he decided that he would have the growth removed, and all arrangements were made to do a partial or complete laryngectomy, according as the condition required. On February 4th the operation, which necessitated about two and one-half hours of actual time employed, was done. The patient was placed in the partial Trendelenberg position and no preliminary tracheotomy was done. A single excision, extending from the hyoid bone to within one-half inch of the sternum, was employed; no transverse cuts were made. Great care and precision were observed in the operation, all vessels being tied before being severed, and there was practically no hemorrhage. When the larynx was ex-

posed, it was found to be almost completely calcified. The box of the larynx was split open and the growth examined. As the condition extended well over to the left side, it was thought best to do a complete laryngectomy and give the patient the opportunity of recovery, with the hope of no possible recurrence. The trachea was divided at the first ring, brought out of the opening and stitched to the skin. The larynx was then leisurely removed from its position. A good flap was obtained from above and the pharynx thoroughly closed off from the wound cavity. An iodoform wick was inserted in the wound and the lips of the wound brought together thoughout, except where the wick projected above and below. The wound was dressed as usual and the patient sent to his room. Reaction was good, temperature not going above 99° during the first twenty-four hours. The second day there was quite a sharp reaction, temperature running up to 102 2-5°; from that time it remained between 99° and 101°, until the termination of the illness. Respiration remained between 20 to 26 until the morning of the patient's death, when it ran up very rapidly. Pulse, lowest, was 77 and never reached above 128 until the morning of the patient's death. The condition of the wound was perfect throughout, only a little hemorrhagic oozing once or twice during the post-operation period. The patient was in good spirits throughout except the night before his death, when he became delirious, though not constantly so. On the fourth day food was taken freely, with no leakage in the wound, showing that there was complete closure of the pharynx from the wound cavity. The patient died on the morning of the fifth day in collapse. As no post-mortem was made, the condition which gave rise to the sudden termination can only be surmised; in all probability, it was cardiac exhaustion. There was very little secretion about the tracheal opening at any time during the operation. The dressing over the tracheal opening did not become very moist. The case seemed a most favorable one until the evening of the fourth day.

Remarks.—The most imporant question in these cases is, "Are they or are they not operable?" Although I was rather disinclined to do anything in this case, it seemed one of the most promising I had ever seen. The growth was localized, entirely intrinsic and extensive; there were no glan-

dular infiltrations, and everything about the patient's neck seemed to promise a most successful issue in case the operation was made. He was anxious to be operated upon and anxious to get well. The operation was done with all due caution and careful technic; so, even in a case that might seem to offer every advantage from its character, the condition of the patient and the surrounding circumstances did not have a favorable outcome. To my mind it seems that complete laryngectomy does not offer a very favorable result in the aged. The violence is very great and it requires a strong, middle life to withstand the shock attendant upon such an operation. Of course, the question of a lesser operation enters into the plea also, for example, partial laryngectomy, done along the lines suggested by Sir Felix Semon, in which there is a partial excision, where there is a removal of the hard and soft parts of the larynx beyond the area of diseased tissues, and the operation which was narrated to me by Dr. J. Solis-Cohen, which consisted of stripping the perichondrium from the inner surface of the chondrium, thus removing the perichondrium, mucous membrane and growth en masse. To me it seems that this latter operation is one that offers great advantage, in case one could be assured that there was no involvement of the chondrium.

PAPER:

A CASE OF MULTIPLE RECURRING PAPILLOMATA OF THE LARYNX.

CHARLES W. RICHARDSON, M. D.,

During the month of January, 1905, there was brought under my care, in consultation, a young man, 32 years of age, who gave the following interesting history:

He stated that, since early childhood, he had more or less difficulty in breathing, and always a hoarse voice. During the last four or five years the voice has been continuously hoarse and rough, and the breathing more or less difficult. During the last two years, he had not spoken above a whispered voice, and the breathing during this period had been so difficult that it had been almost impossible for the patient to make any active physical efforts. He has had to be very cautious in going about. Several times during the month previous to his coming under my observation, he stated he had very violent attacks of difficult breathing, in which it was thought that the patient would suffocate—twice during the week previous and the night before he came to me he had attacks of intense dyspnea—which was the immediate cause of his seeking my aid. His general history was excellent, and there was no occasion to suspect anything of a tubercular character. There was no chest symptoms of any kind. He was tall — 6 feet 2 inches — rawboned and weighed 148 pounds. An examination of his upper air tract showed nothing other than normal. Inspection of the larynx revealed a condition which was rather astonishing. Over the whole left side of the rim of the epiglottis and extending down along its whole lateral border, there was one continuous mass of papillomatous tissue. The whole supracordal portion of the larynx seemed to be filled in with a mass of papillomatous tissue. No space could be seen which would indicate the interval between the vocal cords. These growths seemed to grow from the ary-

epiglotidean folds, from the false cords, from the anterior commissure and the whole of the surface of the true cords. The patient's embarrassed respiration and his general appearance excited my greatest sympathy. Recognizing the fact that I had to do with an extreme case of papillomatous degeneration of the whole mucous membrane of the larynx and the probability of eradicating the condition as thoroughly through the intralaryngeal method as through external methods, I decided to send the patient to the hospital where all arrangements were made to do a tracheotomy, in case that the intralaryngeal method should excite any violent paroxysms of dyspnea. The operation was attended with great good fortune and the growth was rapidly and successfully removed from the body of the larynx, from the epiglottis, from the aryepiglotidean folds and from the false and true cords. I then found that there was considerable growth in the subglottic portion of the larynx, especially on the right side. This was all thoroughly and carefully excised. In the summer the patient was practically free from all growth and was allowed to go abroad. Recurrence had been more or less frequent. During the operative stages, growths removed from one point would remain absent and then show up again after a period of two or three weeks or a month. Growth removed from the aryepiglottidean folds, and false cords showed less inclination to recur than those in the subglottic portion of the larynx. When the patient left me his weight had increased to 179 pounds, general health good, and appearance that of perfect physical well-being. In December he wrote me that he was getting more hoarse and that there had been a recurrence of difficult breathing. I advised him to consult Dr. Edward Law, in London, who, after examination, referred him to Sir Felix Semon. I append herewith a letter from Dr. Law, giving a critical extract from Sir Felix Semon's letter to him in reference to the patient's condition:

"On examination I found almost complete apparently papillomatous (I will at once say what I mean by apparently) degeneration of the larynx, involving both vocal cords, both ventricular bands (badly), the lower surfaces of the epiglottis, particularly on the left side, the mucous membrane over the arytenoid (partly) and a considerable part of the subglottic cavity, particularly on the left side. The movements of the vocal cords were impeded, but not abolished.

On the left side, in the middle of the laryngeal degeneration, there appeared to be two cysts filled with grayish fluid. On the right side of the neck there was a big, moderately hard gland not fixed to the larynx. There were no chest symptoms of any kind.

At first sight I should quite agree with the diagnosis of papillomata, but the presence of the large gland drew my attention to the possibility of the whole affection being of lupoid character, and, the patient being 32 years of age, the remote possibility of malignancy must also not be lost sight of, although the extremely long duration of the symptoms (twenty-nine years) would, of course, militate against this hypothesis, unless one were to think of a transition of benign into malignant growths, which, although extremely rare, yet has, as you know, been a few times actually observed. A certainty on these mooted points will, of course, only be got by intralaryngeal removal of a good-sized fragment and careful examination on the part of an expert.

Needless to say, the question of treatment will have to depend to a great extent upon the results of the microscopic and bacteriological examination. If the disease were purely papillomatous, I should be more in favor of a repeated intralaryngeal removal than of an external operation, seeing that the degeneration is unfortunately so universal that even if the larynx were opened and everything thoroughly scraped, no binding promise could be given with regard to non-recurrence.

Should the disease be malignant, nothing short of total extirpation of the larynx and of the affected gland would give any chance of lasting cure.

Finally, should the disease be lupoid, extensive scraping, applications of the galvano-cautery, tuberculin injections under opsonic control would be the best method. I confess that the lupoid possibility only occurred to me after the patient had left me, and I did not discuss this possibility with him or his mother.

Should the intralaryngeal method be adopted, I would insist on the patient's going to a Home until the epiglottis was sufficiently cleared not to fear any sudden obstruction after the operation. Altogether, the case is anything but nice."

My patient, for various reasons, became dissatisfied with the condition of things in London and took the steamer and

came immediately to Washington, where he placed himself again under my observation. I found the conditions about the same as described by Sir Felix Semon, except that there was no cyst. What Sir Felix thought was a cyst must have either ruptured or evacuated its contents before he came under my observation the second time. The large gland on the right side of the neck below the angle of the jaw was a broken down, cheesy gland, which I have removed. Both of the examinations made of the masses removed showed the growth to be a pure papilloma, without degenerate tissue of any kind being present. The patient returned to me the latter part of January, and is now, after many successful repeated efforts at removal, entirely cleared again of all growths. I simply report this case as one of the most interesting and most extensive with regard to new growth of the many cases of recurrent papillomata that has come under my observation.

I find no positive evidence to justify an opinion that the pieces of tissue from the epiglottis (or wherever they came from) are malignant. They present the appearances of epithelial papillomata, and, in places, proliferation of the surface epithelium is very marked. There are also evidences of inflammation which may be primary or secondary. Many of the papillae are infiltrated with polymorphonuclear leucocytes. There is absolutely no invasion of the underlying tissues of the epithelium. A small myxomatous area was found in one piece only. The appearances found in the sections indicated only papillomatous formations with slight inflammation.

DISCUSSION.

Dr. J. F. Barnhill thought that the reports of the cases spoke for themselves and that the first case was interesting because of the great size of the growth and the success with which Dr. Richardson attacked it; it was the only thing that could have been done under the circumstances as described. He thought that a great many operators were too easily frightened at doing such radical work. These cases, the doctor said, sometimes degenerated into carcinoma. He believed with many American operators that we were justified in a large majority of intralaryngeal growths in removing them if possible through the larynx. He had removed several sim-

ilar, though smaller, growths in this way, and there was never a tendency to cancerous degeneration from any manipulation he had done. As to the second case, this class of surgery has appealed to him about as little as any in the specialty. Many of the patients were old, decrepit and had allowed the disease to progress far beyond the point of successful surgical intervention before he had been privileged to see them. Dr. Richardson spoke of using cocain at one stage of the operation, but he did not state whether he operated under this as the only anesthetic. Cocain anesthesia, where it is feasible, he thought a great help, and better in this character of illness, and in operations upon the upper air tract, than is the general anesthetic.

Dr. Robert Levy said that his experience with papilloma of the larynx had been principally in children with multiple and recurrent papillomata. He had two cases of extensive papillomatous growths in the adult. In both these instances he removed as much as he could by the intralaryngeal method. He later did thyrotomy and successfully cleaned out the whole growth. One of the cases made a fair recovery, that is, his voice was not particularly good; the other case retained a tracheal tube for an indefinite period after leaving the hospital, returning later with pneumonia, from which he died. The great point, he thought, in laryngeal carcinoma was its early recognition, in which a great many difficulties are encountered. He reported a case of a man who had been sent to Colorado for tuberculosis. The appearance of a small nodular growth led him to suspect cancer. It was several weeks before he could bring himself to excise a portion of the growth for microscopic examination, contrary to the general rule in such cases. He felt then that he was justified in this on account of the previous diagnosis of tuberculosis; at the same time he prepared the patient for immediate radical operation. The pathologic report was positive, and thyrotomy was recommended. The patient returned east and consulted specialists in Baltimore, New York and Philadelphia. Dr. Solis-Cohen performed thyrotomy, and at last reports the patient was doing well. Dr. Levy said that laryngectomy had never appealed to him, as the results were disheartening.

Dr. E. W. Day asked which was the preferable way to operate, through the larynx or from the outside? In Pittsburg Dr. Jackson and himself had reported cases of stenosis

of the larynx where thyrotomy had been done, and with a large intubation tube the patients were all given good breathing. As a rule they had been afraid to touch the larynx by external operation. It had been a bugbear years ago. When an operation is done through the mouth with a mirror through sensitive parts, which are in some patients very difficult of thorough cocainization, in cases where the growth is situated under the cords, the endolaryngeal method was, in Dr. Day's opinion, not good. He has never had a case where there had not been good adaptation of the thyroid cartilages. He thought everyone was inclined to overlook the early growths in cancer of the larynx, and to class them as papillomata. He had three cases of small growths which he would have certainly called papillomata and would have tried to go through by the endolaryngeal route. By dissecting out beyond the region of the growth and having a microscopic examination made they were found to be epitheliomata. They had so far shown no recurrence. Dr. Richardson spoke of stripping the perichondrium. In the last six weeks the speaker had to open the larynx for supposed epithelioma. One was a short, stout woman 63 years old, and the thyroid gland lay over the thyroid cartilage of the larynx. On opening the larynx a growth was found the size of a chestnut. The perichondrium was stripped down leaving simply the cartilage on that side and removing the growth and mucous membrane and cutting it away. There was a small hemorrhage, which was controlled by iodoform gauze, which was allowed to remain 24 hours, when it was removed and there was no further hemorrhage. He thought that good results could be obtained by opening the larynx.

Dr. Norval H. Pierce said that the laryngoscopic image of laryngeal neoplasms was often misleading. In the last case of laryngeal cancer he was interested in, the laryngoscopic mirror gave one the impression that a small cancer on the left vocal cord was confined to its upper middle third. When the larynx was opened it was found that the carcinoma extended down to the subglottic region and over to the opposite side, so total laryngectomy had to be performed. When the attempt was made to remove pieces of the laryngeal neoplasm for microscopic diagnosis, it should be taken from the interior part of the growth. The speaker did not agree with Dr. Day that in all cases the external operation should be resorted to. Regarding the so-called septic pneumonia, from experiments

upon animals, he had reason to believe that the pulmonary changes which took place and the subsequent sepsis was not altogether due to discharges getting down into the tracheal wound, but to a sinking or suction of the pulmonary structures down into the thoracic cavity on account of the severance of the suspending musculature of the larynx. In total extirpation of the larynx the attachments by which the bronchial tree is held up are cut, and it is well known how the trachea will sink sometimes below the sternal notch. He suggested that it might be advisable to do the operation in two seances. Loosen the larynx and allow it to remain until adhesions have formed, and then divide it. The other way he thought would be to sew it to the muscles that had been separated.

Dr. Frank E. Miller said that after Dr. Richardson's masterly arrangement of the subject little remained to be said save that of personal treatment. In every case of laryngeal neoplasm, Dr. Miller followed out constitutional treatment, whether single, multiple or multiple recurrent papillomata, and gave fluid extract thuja occidentalis in from one to sixty minim doses, in combination with potassium chlorate, one to five grains, and potassium iodide, one to twenty grains, as a specific. For a long time he applies three times weekly a mixture of fluid extract thuja occidentalis rubbed up while warm, one to four. This was applied directly to all papillomata that could be reached. This mixture is too irritant to spray, and should be used at first after cocain has been applied. In one case he reduced the tendency to recurrence so that after four months' training he was able to remove in one sitting of three-quarters of an hour all the papillomata to the number of seventeen, so that the patient's aphonia that had been constant since an attack of measles in her ninth year was entirely relieved when she was twenty-eight, and remained so until her death, due to cirrhosis of the liver, in her thirty-first year.

For a period of a year her throat was examined, and any sign of recurrence was immediately subdued with twenty-five and fifty per cent solutions, sometimes even pure. This treatment in connection with a constant spray of Thiersch's solution (salicylic acid, one grain; boracic acid, six grains to the ounce) was applied five times a day by the patient at home. This was gradually increased to salicylic acid, five grains, and

boracic acid, twelve grains to the ounce. Alcohol, chemically pure, is ideal in such cases. Three cases of papillomata were cured by it. Many report failures with alcohol, but he thought his success was due to the fact that it was used by the patients at home as well as at the office. It must be sprayed over the papillomata at least three times a day to secure satisfactory results, and the patient must be urged to keep it up, although almost suffocated at first by it. Of course, there were cases of young children where the papillomata were so abundant and vigorous that the only thing to do was to perform tracheotomy at once, as growths might obstruct by their profusion and also deep location in the trachea, so as not to be seen. Two intubations for papillomata in children were dire failures for the papillomata were pushed down by the tube, and those that were already below the tube made a combination that required not only a tracheotomy through the crico-thyroid membrane, but also in the low position afterward. Recently he had occasion to send a case to Dr. George Brewer, Roosevelt Hospital, where a mass of papillomata about the diameter of a lead pencil was found between the upper and lower tracheotomies, when the larynx and trachea were opened for the removal of multiple papillomata of eight years' standing (the tubes having been removed because the papillomata had disappeared from the epiglottis and vocal bands, due to one year's spray with Thiersch's solution at home), but after the tube was removed there was considerable dyspnea. The boy is now well, but aphonic. Puberty alone often causes a disappearance of these growths, but although in all the cases that he had seen the exanthemata had been cited as the cause, yet a history suspiciously leuetic could be obtained by heredity. Tracheotomy always enforces rest to the parts above the tube that seems to diminish the activity and tendency to recurrence. Most all of the last set of cases required tracheotomy, and, finally, a thorough removal by splitting up the larynx and trachea.

Through the courtesy of Dr. Frank Hartley, he had the privilege of seeing the laryngeal cancer cases in his service at the New York Hospital. A case of eight months' standing that he had sent to Dr. Hartley eight years ago is still alive and in excellent condition with the entire larynx out. There was still another whose life had been saved. He thought that these cases should be recognized earlier than they usually

were. He recalls distinctly another case with what seemed clinically a small papilloma on the upper surface of the left vocal cord, near the anterior commissure, on his first visit, which he immediately removed and sent to Dr. Henry Brooks, of the Post-Graduate Medical School, who reported it as a typical case of epithelioma. On the next day this growth, which had been taken off very cleanly, seemed to present a thick, heavy base, larger than before removal, when another piece was cut off. On the following day the same thick, heavy base appeared again. If this had been a simple papilloma, no such thing would have taken place, and this point is worth investigating, as he had not heard any one mention the fact before. The patient refused operation at that time. One year later, he entered a New York hospital on the service of Dr. Frank Markoe, who transferred him to Dr. Frank Hartley. This patient died, as every case has that he had ever seen, of a septic pneumonia, three weeks later. In fact, in his experience, all these cases die this way. And yet, he, Dr. Miller, was firmly convinced that if this patient had the operation at the time when first seen, he would be alive and well today. Just as happens in phthisis, there are many forms of infections to overcome other than the original infection. The system becomes worn out and so poisoned by these multiplex infections that we have no chance to fortify the system against subsequent attacks of cancer.

Dr. H. W. Loeb said it had been his lot to see seven cases of carcinoma of the larynx in which operation was done. In one case, where the man was comfortable for a year, a second operation was done, and the patient died. Another case was operated on two and a half years ago, and five weeks thereafter was enabled to go back to work as a bricklayer, and he has remained well since. His trachea was stitched to his skin. The next case proved to be an atypical form of tuberculosis, who died two weeks after operation. The next case had a very large carcinoma, for which he had been treated five months. All structures were dissected from the larynx, and the trachea was attached to the neck wound. One week later he had a slight hemorrhage, and he died suddenly from a pulmonary embolism, which probably originated in the jugular. In considering carcinoma of the larynx, he thought it wise to look at the statistics of Sendziak. It seems that carcinoma remains intrinsic a long time, and does not affect glands ex-

ternal to the larynx until later. In the opinion of the speaker, if the patient can be brought through without serious results, he has a fair chance for recovery.

Dr. Kaspar Pischel mentioned that Dr. Payson Clark recently, at the meeting of the Americal Medical Association in Boston, showed three children with papilloma. In his paper, Dr. Clark declares the best treatment is to do a tracheotomy, and have the child wear a tube as long as the papillomata are seen to be growing. At the age of foureen they frequently disappear; if not, they should be removed.

Dr. Charles W. Richardson, in closing the discussion, said, regarding thyrotomy in cases of recurrent papillomata, the tendency to recur makes that operation one not offering the best results. The preferable one in children was tracheotomy.

PAPER:

THE RESULTS OBTAINED FROM THE RADICAL OPERATION FOR CHRONIC PURULENT OTITIS MEDIA.

S. MacCuen Smith, M. D.

In accepting the invitation to discuss the subject of this paper, my understanding was that a review of the writer's personal experience was desired, not a critical examination of the literature on the subject. My first thought was to give in tabulated form the more or less complete notes of about two hundred operative cases, but the time allotted to papers will not permit of this lengthy discussion, so we will reserve this for a future paper.

With the possible exception of acute mastoiditis and the indications for operating thereon, no other subject in otological literature has elicited more thorough investigation and discussion by the best intellects in the profession, than that dealing with the various methods at our command to combat successfully the ravages of a chronic suppurating ear. Many of us are familiar with the extensive opposition formerly encountered when the operation under consideration was advised. To this very antagonism, however, we, as well as the public in general, are greatly indebted, for it seems to have acted as a stimulus, irresistible in character, to further the dauntless courage and incessant labors of the few pioneers, who builded even better than they knew.

Enthusiasm, properly directed, is essential for the successful promotion of almost any radical change or advancement. This is true, especially, in its relation to conservative medicine. The enthusiastic advocate of a new surgical problem, therefore, occupies a very important place in the actual advance of medical science, for although this earnestness may carry his measure beyond the line of prudence, or even safety, thus simulating what may be termed frenzied surgery, he will soon be brought

to a proper realization of its worth, by running counter to the apathy of the ultra-conservative element of the profession, and all that pertains to its correcting and beneficial influence. It is the middle ground, the compromise that those two extreme elements eventually adopt, that will prevail. The subject of this paper has passed through the various stages above enumerated, and we are now settling down to a well-defined, rational conception of the disease and its remedy.

Not long since, it appeared that our success in curing a chronic discharging ear by means of the radical operation made it incumbent upon us to adopt this method of treatment indiscriminately; more recently, however, a healthy reaction has become quite manifest, and we are again disposed to resort to ossiculectomy and tympanic curettement as an efficient means of relieving suppurating ears of a definite character. Indeed, it is the writer's belief and teaching that the minor operation should first be employed in the large class of cases where mastoid or other intracranial complications are not suspected, or where symptoms do not demand the immediate adoption of more radical measures. On the other hand, however, it must be remembered that a great majority of the serious complications, both intracranial and general, incident to such a condition, arise from the chronic form of disease; moreover, some complications, such as brain abscess, may have actually existed for some months, or even for a period of years, without producing symptoms peculiar to their kind, apparently without cause, or perhaps following slight injury to the head. These abscess formations suddenly give rise to most alarming phenomena, which must always be viewed with grave apprehension, inasmuch as the symptoms are frequently so ill defined as to render a correct diagnosis impossible. No doubt many of us have been subject to the keen mortification of operating on a suspected temporo-sphenoidal or cerebellar abscess without having our diagnosis confirmed by the findings, and yet, all the antemortem symptoms indicating the diagnosis as made were sustained by neurologists and general surgeons of ability, whereas the autopsy revealed the lesion to be located in another part of the brain.

Mention of these facts is made for the purpose of again calling attention to our faulty and misleading methods of determining brain localization in lesions arising from diseases of the

organ of hearing. Furthermore, the above will serve to illustrate in a forceful manner the one cardinal point, the chief factor indeed, in dealing with all classes and varieties of pus formation and necrotic changes occurring within the temporal bone, namely, to strive to eradicate the disease by whatever means may be necessary, before any of the more serious complications have time to develop. The discharge of pus from any part of the ear must be regarded as a daily menace to the health and life of the individual so afflicted; this truism is not in any sense modified by knowledge of the fact that cases have been observed to exist for many years without the development of serious complications.

This brings us to a consideration of the best means of treating cases of chronic suppurative otitis media. First, however, it is well that we recall the indications for the radical operation, inasmuch as it is now generally conceded that the more simple method should first be employed in selected cases.

Notwithstanding this fact, however, a thorough and exhaustive analysis of every detail of the subject will establish the unalterable conclusion that the radical operation is the only satisfactory method that can be adopted in the vast majority of cases. This conclusion is so convincing that even the most skeptical and ultra-conservative are ready converts to its utility, when brought in actual contact with the results.

In this connection the writer is forcibly reminded of a certain percentage of cases subjected to the radical operation, in which the discharge does not cease within a reasonable time, or having once stopped, is subject to relapse. At one time these annoying cases were quite numerous, but as the technique of the operation improved, and the deftness and understanding of the surgeon developed, these cases have grown less and less with each succeeding year, so that the necessity for secondary operations has been reduced to a minimum. The chief causes for these relapses were incomplete or faulty operations, especially in relation to undiscovered necrotic cells of the zygoma and the mastoid tip, as well as reinfection occurring from the Eustachian tube; at the present time we would consider these sources of autoinfection mostly preventable. In considering the indications for performing the radical operation, we must not lose sight of the important fact that the attic, the aditus and the antrum are integral parts of the tympanic cavity and usually share in its

infections. This fact alone explains why so-called suppurative otitis media cases become chronic and remain so, and furthermore, shows the folly of protracted efforts to relieve a condition that cannot possibly be reached through the external canal. We must earnestly endeavor to impress upon the mind of the profession this one fact of vital importance, namely, that the discharge escaping from the external canal is nothing more than a local manifestation of the necrotic changes occurring within the mastoid antrum and lower cells or the cranial cavity, and that the middle ear cavity and auditory canal through which it passes are important chiefly as a safety valve or means of exit for the overflow pus. In other words, it must be observed that a dense bony wall separates the external canal from the actual site of the disease, the only communication being the narrow opening connecting the tympanic cavity with the mastoid antrum.

In this connection, therefore, we again wish to call attention to the extreme folly of adopting any line of treatment which at best can have little more for its object than cleanliness of the external parts. In no possible way can the cases under consideration receive benefit by the application of such measures, and we should lose no opportunity to effect the proper recognition and conception of these facts.

Broadly speaking, the writer believes it is not only wise, but urgently imperative, to perform the radical operation in all cases that do not yield to the more simple measures within a reasonable time; and as the duration of time in this connection can be applied only in a relative sense, we must, after all, depend on our good judgment in determining the proper time to operate; a sane judgment should develop with experience, with which there is usually associated a peculiar intuition, always more or less difficult of explicit interpretation, but which may be safely followed. From time immemorial, the presence of pus in any part of the economy has been considered the most potent foe of the human race; this is especially true when confined within a cavity, the integrity of which must sooner or later yield to the ever increasing pressure caused by the accumulation of inflammatory debris and the necrotic changes incident thereto. Why these sound surgical principles as applied to a more or less blind cavern as the mastoid process should be viewed with such an unusual sense of apathy, especially when we recall the vital structures immediately adjacent thereto, is difficult to comprehend, except that knowledge of the unusual

danger likely to be encountered forbids a prompt acceptance of such responsibility. However, it is just this hesitancy, this procrastination, this putting off until the morrow, that invites additional complications and frequently their fatal termination.

We encounter cases of either acute or chronic suppuration in which a carious fistulous opening eventually penetrates the mastoid cortex, giving rise to periostitis and the classical symptons of mastoiditis. These patients on account of the formidable objective symptoms become alarming to the attending physician, but this ocular manifestation of the disease is decidedly favorable rather than unfavorable, as it indicates that the direction of the inflammation is external rather than internal. It is those cases of tenderness, however slight, on deep pressure, without external evidence of deep-seated mischief, that are of much greater import, indicating as they do that the direction of inflammatory involvement is inward.

As stated in the beginning, the scope of this paper will not embrace a review of literature, of which there is much, worthy of profound consideration, but to these general remarks will be added a few personal observations and conclusions.

The operation in the majority of cases has no detrimental effect upon the hearing. If any change at all is brought about by the operation, it would be for the improvement, rather than impairment, of the function of hearing. On the other hand, however, we must not lose sight of the fact that occasionally we find a case that will be positively made worse by the operation. I have never been able to give any explanation of this fact. Hankins (Australasian Med. Gaz., Vol. 24, 1905, p. 199) says: "I think there is every prospect that before long the results will so improve that it will be justifiable to operate with a view to increasing the hearing power, impaired by long suppuration, which may at the time have ceased." This enthusiastic statement, however, had perhaps better be qualified by the provision that one should determine definitely whether the impairment of hearing in a given case is due to tympanic disease or to labyrinthine involvement. As epidermization progresses we usually find some impairment of hearing, as the skin covers the tympanic cavity, this part being usually the last to be covered.

Injury to the tympanic branch of the facial nerve is not frequently encountered at the present time, owing to the improved

technique. However, we find in some cases a facial palsy of mild degree occurring several days after operation. This may be accounted for by the formation of an inflammatory exudate with the Fallopian canal which always disappears within a very short time under the influence of electricity. Other possible injuries, such as injury to the jugular bulb, semi-circular canals and the sigmoid sinus, are all very infrequent occurrences.

A point to which I wish to call particular attention is the frequency with which we find a carious opening through the tympanic roof, which the writer has reason to believe is often overlooked, and inasmuch as it is a source of drainage for an extradural and also a temporo-sphenoidal abscess, the importance of discovering this opening is manifest. It is frequently too small to provide for proper drainage and must necessarily be enlarged. The writer believes this to be one of the frequent causes of prolonged suppuration following the radical operation.

It is most important that both the malleus and incus, and especially the latter, should be removed at the time of operation. On account of the deficiency of nutritive vessels supplying the incus, we are inclined to feel that it has become disintegrated and discharged in the form of pus, but a more careful search will frequently discover it in some portion of the tympanic cavity, and if overlooked must necessarily be the cause of an indefinitely continued discharge.

As regards skin grafting, in the early days of the radical operation, the writer attempted the various methods of skin grafting, but in later years he has abandoned this procedure entirely from the fact that virtually any of the complications following the radical operation have occurred in those cases in which he had attempted skin grafting. The only benefit that can be derived from skin grafting is the questionable claim that it shortens the length of convalescence. However, by following the line of treatment which will be detailed presently, we feel that the results are better and more quickly obtained and that thorough dermatization is accomplished in much less time than when skin grafting was resorted to.

The character of the discharge is a matter of the greatest importance in determining the necessity for immediate operation. A continued foul-smelling secretion always indicates necrotic bone and this in turn requires operative interference.

The writer believes that the presence of the pneumococcus, streptococcus or the bacillus of influenza in the discharge, or the presence of cholesteatoma in the ear is an absolute indication for the radical operation, as in his experience these microorganisms have been found either singly or as a mixed infection in practically all of the intracranial complications. He further believes them to be chiefly responsible for the extensive carious involvement of either the middle ear or mastoid.

On account of the obscurity of such cases to the uneducated eye, they are allowed to progress on their deadly mission, day by day, week by week, or month by month, until eventually life is destroyed without the ear, the primary or underlying cause, being suspected. The chief object of the present medical age would seem to be the prevention of disease, but it is not entirely complimentary to a learned profession, vested with the rights and responsibilities of conserving the public health, to manifest such utter disregard for the prophylaxis of certain diseases of the ear. It would not be possible for such unsanitary conditions to prevail in any other branch of surgery, which indeed compare favorably with the discreditable seton age, when a knotted string was pulled through an enlarged gland for the purpose of its dissipation. Modern surgery demands the prompt eradication of pus, necrotic tissue and all other inflammatory debris wherever located; the ear and its accessory cavities can no longer be the one conspicuous exception.

As we now recognize that more than ninety per cent of all brain abscesses are traceable directly to aural disease; that practically all cases of sinus thrombosis are due to the same cause, and upon further reflection are reminded of the numerous cases of meningitis and other serious general ailments that complicate diseases of the ear, it should be our constant aim to convert the widespread apathy that tolerates the existence of so large a number of secondary diseases, many of which are positively preventable.

The limits of this paper will not admit of even touching upon the technique of the operation, except to state that, however perfectly we may execute every surgical detail, our final results will not be that which might reasonably be expected, unless we are prepared to personally conduct the after-treatment; the absence of this personal care will account for many of the slow recoveries.

It may be of interest to relate somewhat in detail the line of post-operative treatment which the writer has followed for some years, by means of which, furthermore, he has secured very satisfactory results. The chief object of this method of treatment consists in keeping the propagatory surface dry, inasmuch as heat and moisture favor the rapid multiplication of microorganisms. The dressing applied at the termination of the operation is not disturbed for a period of from five to seven days, at the end of which time the packing is removed and is not again reinserted. The ear is then syringed with a 25 per cent solution of hydrogen peroxide, then normal salt solution, and this is followed by a 10 per cent solution of alcohol, the latter being gradually increased in strength until absolute alcohol is used. After syringing as above stated, the entire ear cavity is carefully and thoroughly dried under good reflected light, then a powder composed of equal parts of aristol and boric acid is liberally insufflated over the entire cavity; the same powder is also placed over the mastoid incision and the dressing applied. This method of treatment is applied every second day until the discharge has markedly decreased. The frequency of subsequent dressings will be governed by the amount of discharge.

A modification of this line of treatment will consist in cleansing the canal with the above solutions by means of the cotton wrapped applicator in cases where there is only a scanty discharge. This modification is especially applicable to cases after the first two or three weeks, at which time the discharge has greatly decreased.

With this method of treatment it is the exception to find the appearance of exuberant granulation tissue. This is particularly true and worthy of special mention in treating syphilitic and tuberculous cases in which the tendency to granulation tissue is very marked.

PAPER:

THE RESULTS OBTAINED FROM THE RADICAL OPERATION FOR CHRONIC PURULENT OTITIS MEDIA.

EDWARD BRADFORD DENCH, M. D.,

Owing to the frequency of chronic middle ear suppuration, and the fatal results which so often follow this condition, if it is left uncontrolled, it is no wonder that the radical operation for the cure of chronic middle ear suppuration has been greatly exploited during the past decade. The true value of any surgical procedure can be determined only after the operation in question has been in vogue for a number of years, thus giving an opportunity for the ultimate results following operative interference to be decided upon definitely.

The results obtained by the operation in question, may be considered under the following heads: 1st, the efficiency of the operation in protecting the patient against intracranial suppuration; 2nd, efficiency of the operation in causing a permanent cessation of the otorrhea; 3rd, the immediate and remote effect of the operation upon the function of the organ, and 4th, the effect upon the integrity of the facial nerve.

I have upon my books at the present time records of 193 operations of this character. In none of these patients, so far as I know, has there been any evidence of an intracranial lesion after the suppuration has been relieved. We may say, therefore, that the radical operation certainly does protect the patient from the dangerous sequelae of middle ear suppuration.

When we come to consider the matter of the permanent relief of the otorrhea, the results obtained by this procedure are, perhaps, not as flattering as we had hoped they would be when the procedure was first suggested.

Out of 193 cases, there are 131 cures, 29 with slight discharge, 5 with profuse discharge, 2 still under treatment, 6 fatal cases, and 20 cases in which the result was unknown.

In going over these results more in detail, if we take out the 20 cases in which the result is unknown, we have 173 cases, of which 131 are cured, or a little over 75 per cent. Out of the last series of 95 cases, the cures amount to exactly 80 per cent, in those cases in which the results are complete. In the last series of cases, in no instance did the discharge remain profuse after the operation, all of the cases being either dry or presenting but a slight discharge from the meatus. Of the 6 deaths, two patients died of pneumonia, two of meningitis, one of cerebral abscess, and one of cerebellar abscess complicated by sarcoma of the auditory nerve. In no instance could death be attributed either directly or indirectly to the operation.

Of those cases which were operated upon several years ago, and which have been followed carefully, the results have been most satisfactory. Even where a small amount of discharge has persisted for weeks or even months after the operation, this discharge has in almost every instance disappeared absolutely, without the necessity of secondary interference, under simple measures of cleanliness.

Even in those cases where the cure has been considered perfect, it is not uncommon to have the patients return, at intervals of from four months to one or two years, complaining of some discharge from the external auditory canal. An examination will show the entire cavity filled with a mass of desquamated epithelium, upon the removal of which a small amount of pus may be found. If this accumulation has remained in the canal for a considerable period of time, desquamation of the epithelial lining of the cavity may have taken place either completely or over certain areas. On removing the epithelial mass, the cavity certainly looks far from healthy, and one unaccustomed to this condition, would certainly say that the radical operation had been a failure. If the cavity is simply sterilized with an alcoholic solution of bichlorid of mercury, and then dusted with some bland, non-irritating powder, such as boric acid, xeroform, zinc oxid, or, in fact, any sterile powder, the cavity immediately becomes dry. In other words, the apparent relapse in so many of these cases is due simply to the fact that the integument lining the middle ear cavity and the mastoid cells, is improperly nourished. This integument forms the lining of a blind pouch where it is sub-

jected to increased temperature, increased moisture, the absence of light, and no circulation of air, these latter conditions being essential to the proper nutrition of the normal skin. Moreover, it must be remembered that this tegumentary lining is applied closely to the bony walls of the cavity, with very little connective tissue substance intervening.

It is not strange, therefore, that desquamation should take place from time to time, in such a cavity, and that the desquamated epithelium, if allowed to remain in position, should gradually accumulate until the cavity becomes completely filled with these epithelial cells. The production of these cast-off cells causes superficial ulceration of the underlying tissue, so that complete desquamation of a cavity of this kind frequently takes place. These attacks of desquamation of the cavity occur less and less frequently as time goes on, because the integument gradually adapts itself to its new habitat, and in the course of time is able to conform itself to its anomalous position.

These attacks of desquamation should not be looked upon as a recurrence of the otitis. As before stated, they are easily relieved by the removal of the epithelial detritus, and the sterilization of the walls of the cavity.

When the radical operation was first proposed, and, I am sorry to say, even at the present time, many surgeons hesitated to advise the procedure for fear of impairing the function of audition, as the result of operative interference. In the series of cases in which I have advised this operation, I can state that in but very few instances has the hearing been made worse by the procedure.

Out of 111 cases, in which the hearing records were kept, the hearing after the operation was good in 99, was fair in 9, and was bad in 3. By "good hearing," I mean hearing where the whispered voice was heard anywhere from 5 feet to 15 feet, and by "fair hearing," where the whispered voice was heard from 6 feet to 3 feet, or 4 feet. In the 3 remaining cases, where the hearing is recorded as "bad," the hearing was worse than before the operation.

If the operator exercises caution in his manipulation, and is careful neither to dislodge the stapes, nor to impact it in the oval window, he can promise the patient almost certainly that the hearing will not be greatly interfered with as the result

of the operation. This remark applies to those cases in which the hearing is considerably impaired before the procedure is undertaken. Given, for instance, a case of chronic middle ear suppuration, where the low whisper is heard at a distance of 10 feet, in such a case, impairment of the hearing might follow operation. With a whispering distance of 3 or 4 feet, however, the hearing would hardly become impaired as the result of the operation, while the chances of improvement in the hearing would be considerable.

I have a number of cases at the present time under observation which were subjected to the operation a number of years ago. In these cases, the hearing has steadily improved, owing probably to a gradual mobilization of the stapes by sound waves. In those cases, therefore, where no labyrinthine lesion exists, as evidenced by careful functional examination, and where there is a moderate impairment of hearing prior to operation, the surgeon need not hesitate to advise the procedure for fear of impairing the function of the organ. The hearing is more apt to be improved by the operation than to be impaired by it.

Referring to those unfortunate cases where a partial or a complete facial paralysis results from the operation, either immediately, or where it supervenes at the end of a few days, I can only say that in my own experience, the function of the facial nerve has ultimately been restored in every instance. Out of the last 95 cases operated on, facial paralysis occurred in 4 instances, and in every instance, the function of the facial has been restored.

Of the series of cases previously reported, the exact number of instances in which the facial was involved, is not definitely known. (Transactions of the 7th International Otological Congress, Bordeaux, 1904.) I should say, however, that secondary paralysis occurred in about the same proportion of cases in these two series. In those cases where facial paralysis comes on at the end of two or three days after the operation, the function of the facial nerve is usually restored at the end of two or three weeks, although I have seen several months elapse before power was completely restored to the facial muscles. In those cases, where facial paralysis comes on immediately after the operation, the period before complete recovery takes place is often long. Here six, seven,

eight, or even more months may elapse before all evidences of facial paralysis disappear. If, however, the facial nerve is not completely severed at the time of operation, I believe that its function will be entirely restored in the very large proportion of instances.

Where facial paralysis does occur, it is best treated by daily applications of either the galvanic or faradic current, the galvanic being used where the muscles do not react to faradic stimulation. Where the muscles react to faradism, the faradic current is to be used. In addition to the use of electricity, the administration of strychnin internally, seems to hasten the restoration of the function of the nerve.

You will understand that I am speaking now simply from my own statistics, and in no single instance have I seen, in my own cases, permanent facial paralysis follow the operation.

So much for the ultimate results obtained in these cases. Certain questions have come up in regard to the technique of the operation, which may perhaps be discussed here.

First, the advisability of primary grafting.

Second, the advisability of secondary grafting at the end of five to ten days after the primary operation.

Third, the advisability of the introduction of grafts through the canal.

Fourth, anomalous methods of healing after skin grafting.

There is no doubt in my own mind as to the advisability of employing large skin grafts for lining the bony cavity formed during the radical operation. It is true that all of these cases will recover, and will recover quite as well if skin grafting is not employed. From a considerable experience, however, I am absolutely certain that the period of convalescence is shortened if skin grafting is employed, either as a primary procedure or from five to ten days after the original operation.

Out of the last 95 cases, primary grafting was employed forty-eight times. The grafts did not take in every instance, but in at least 75 per cent of the cases the grafts adhered, either in part or throughout. The application of either primary grafts or of secondary grafts certainly shortens the convalescence.

Regarding the advisability of applying grafts through the external auditory meatus, this procedure has been advocated by a number of writers. I have employed this method in but

one instance. Here the result was satisfactory, but here also, the external auditory meatus had been very greatly enlarged by means of a plastic operation. I do not think that the application of Thiersch grafts through the external auditory canal is applicable to a very large proportion of cases, and I prefer, therefore, to apply the grafts either at the time of the first operation, or to do a secondary operation for the purpose of grafting the wound through the posterior opening.

As to whether the skin graft is to be inserted at the time of the primary operation, or at a later date, will depend somewhat upon the choice of the operator, and very largely upon the pathologic conditions found at the time of the operation. If the case operated upon is what may be termed an "interval" case, that is, if there are no symptoms of acute suppuration, if there is but little fluid pus in the mastoid antrum and mastoid cells, and if neither the dura or sinus is exposed at the time of the operation, I believe that primary grafting should be the rule. The fact that either the sinus or dura in the middle cranial fossa is exposed at the time of the primary operation, does not necessarily prevent the operator from lining the interior of the cavity with a skin graft, provided the sinus and dura seem normal. Care should be taken, however, that the grafts be applied only to those parts of the middle ear not in the immediate vicinity of the exposed sinus or dura. Where the sinus has been exposed, it is my invariable rule not to close the posterior wound completely, but to insert a small gauze drain over the sinus and bring it out at the inferior angle of the wound. This gauze drain is removed at the first dressing, and may or may not be replaced, according to the condition found. In cases which are particularly foul, that is, where the mastoid cells are found to contain fluid pus, or where the necrosis is extensive, I seldom employ primary grafts. In these cases the posterior wound is not sutured. The plastic operation on the auricle is done, the posterior wound packed and the case dressed first on the third or fourth day. After this time, it is dressed daily until healthy granulations are found lining the entire radical cavity. Any time from five to ten days will be a favorable time for grafting upon these granulations. Of course, after the secondary grafting, the posterior wound is completely sutured.

There is one method of healing which has been observed in a number of cases that have been grafted primarily. In certain

instances, it is unwise to apply the grafts over the entire bony cavity, owing either to exposure of the sinus over a limited area or exposure of the dura. In cases where the cavity is partially grafted, and the remainder allowed to heal by granulation, the grafts may become incarcerated in the granulation tissue; that is, if the graft is applied to the fundus of the bony cavity and not to the walls, granulations may spring up from the walls, and for a time almost completely hide the grafted area. As these granulations are controlled, however, the fundus of the canal will gradually appear, and the graft will be found in place and adherent, and the fundus dry.

Another condition which is sometimes met with, is an adhesion between the upper wall of the operation cavity and the facial spur. In cases where the middle cranial fossa lies very low, it is sometimes impossible to prevent this adhesion from forming. On examining the ear we find the radical cavity divided into two parts by a septum or partition, a posterior portion, made up of the mastoid cavity, and an anterior portion comprising the atrium and vault. In some instances, this septum may extend nearly to the meatal opening. We seldom find the ear perfectly dry while this septum is present. If simple cleanliness is observed, however, the septum gradually disappears, and after an interval of from three to nine months after the operation, the entire radical cavity will be found to have resumed its proper form. In one instance, I remember that this septum so obstructed drainage, that it was thought a secondary operation might be necessary. Simple division of the septum and packing the wound with gauze, brought about a complete and permanent cure.

I have attempted to present the results following operation, as clearly and concisely as possible. The paper simply embraces a study of my own cases, and does not deal at all with the experience of others.

DISCUSSION.

Dr. Norval H. Pierce spoke of the changes in audition after operation. He believed that the following tests should always be made before operating: that is, first the whisper test; second, the test for low sounds; third, bone conduction and

lateralization, and fourth, Rinné's test. In this way we may ascertain whether there is stapes ankylosis or nerve degeneration. He has been surprised to find how often the auditory nerve is affected in suppurative ear disease; whether this was due to absolute invasion of the labyrinth by the suppurative process, he felt himself unable to say, but when one is sure it has invaded the labyrinth the course is very different. Where there has been no stapes ankylosis and no nerve involvement before operation, the audition has been improved, or unchanged.

Dr. Charles W. Richardson had had about a half dozen cases of facial paralysis coming on after the operation. All of these cases were now ancient enough to have completely and absolutely recovered. He recalled attention to the fact that he applies no packing after the primary packing has been removed. He thought it one of the most satisfactory operations that he knew of; it gave good results. His results had all been satisfactory. He called attention to a case he had operated upon recently in which a web had been found between the superior wall and the facial ridge. It was let alone and is now gradually disappearing. He had cavities where the granulations nearly filled them up, which latterly become capacious as the cicatrization takes place. Dr. Dench had told him that in his experience webs usually break away and clear up.

Dr. E. M. Holmes said that more positive results could be obtained in this class of cases than in any other. Regarding the facial nerve, he related one interesting case of a girl of about 35 who had facial paralysis for 13 years. He operated on the mastoid on the right side, and after completing the operation a large chestnut could have been placed in the cavity. The case went along nicely, but the facial paralysis persisted. She returned a month ago with considerable power on that side of the face. Doctor Lund had performed anastomosis between the hypoglossal and facial nerves. Unless she laughs, the paralysis is unnoticeable. Regarding the skin flap, for four years he has been performing an operation in which his first incision is carried through the skin only. It is dissected forward, not injuring the periosteum. The posterior superior portion of the cartilaginous canal is severed near its attachment to the bony canal and the auricle is carried forward. With a small angular knife an incision is carried

through the skin and periosteum of the bony canal at about the junction of the superior and anterior quadrants above, and the posterior and inferior quadrants below. Between these an incision is carried just outside the annulus. An incision is also carried through periosteum of the mastoid from the incision of the superior portion of canal backward over the temporal line. From the outer end of the lower incision in the canal the periosteum is incised on a line toward the mastoid tip. The periosteum is carefully elevated from the canal and mastoid, that from the canal is covered by the skin of the canal. The flap of skin and periosteum is rolled back and covered with moist sterile gauze. After the mastoid and middle ear have been exenterated, all rough bone is smoothed so as to leave a gradual slope, and the periosteal-skin flap is adjusted. The auricle is carried to place and fastened with gut sutures. The wound is closed and sutured and a gauze pad applied so as to keep the skin in contact with the periosteum. A tube or wick is inserted in the auditory canal and the usual bandage applied.

Dr. W. C. Phillips said that he would like to discuss three or four points, and the first one was that related to the fatalities following the radical operation for chronic suppuration of the middle ear. The reader of the paper relates six fatalities, and the speaker wished to emphasize the fact that while fatalities were few and may usually have no special connection with the operation, the fact remained that they did ensue. At the Atlantic City meeting two years ago, he had reported two fatalities following the radical operation. It was discussed by a number of men, everyone of whom reported from one to three cases. Since that meeting, two more fatalities had occurred in the speaker's practice; one of them the result of a brain abscess of long standing, which was discovered only at the time of the operation, and which, after evacuation, rapidly developed a general septic meningitis, and the other a case of purulent meningitis, both of which he expected to report in full. The brain abscess was an old one and had no doubt been in a quiescent state for many months. Another question, that of facial paralysis, should not be underestimated. From what he had seen and heard, facial paralysis, usually temporary, occurs more frequently than is ever read of in the journals. While it may be but temporary, it is annoying during the months it re-

mains. He had been very fortunate himself in this regard, and attributed it to the experience he had gained in teaching the radical and other operations upon the cadaver for so many years. For the past two or three years he did not recall a case, aside from two which came on from pressure of packing and were but temporary. Regarding the anastomosis of the facial and hypoglossal, it had been done, but the procedure was not yet proven to be of much benefit. Regarding skin grafting, the speaker noted that Dr. Dench was still enthusiastic, but that he was one of the few in New York City who had much confidence in it and its results. The speaker has practically abandoned it, and is able to get better results without it than by its use. He thought there were several objections to it, chiefly that it required the patient to submit to a second operation.

Dr. Kaspar Pischel said that some patients returned thinking that the operation had done no good; however, it is very well known that it is but the breaking down of the poorly nourished integument. He has devised a flap which will furnish a good skin and will allow the wound to close immediately. (Published in the *Archives of Otology*, Vol. XXX, No. 2, 1901.) The doctor demonstrated his procedure.

Dr. E. B. Dench, closing the discussion, said he had performed a radical operation, found the facial nerve and exposed it for three-quarters of an inch. When it was picked up there was no response to mechanical stimulus. Two years later the patient had perfect control. Provided there is no division, there is no limit as to time when functions may be restored. He thought Dr. Richardson's idea of introducing no packing after the primary packing had been removed, was exceedingly good. He was much interested in the periosteal flap mentioned by Dr. Holmes, and what Dr. Phillips said regarding fatalities was also true. There are a good many cases quite serious when they come under operation. They have chronic suppuration dating back for years and have been suffering perhaps from intracranial infection, prior to operation. He thought that in a certain proportion of these cases a meningitis or brain abscess may be lighted up. On the other hand, at autopsies, brain abscess cavities are found absolutely sterile. If the slightest infection is introduced a brain abscess may be verified. Out of 95 cases there were only four cases

of paralysis. He was also in accord with what Dr. Phillips said regarding skin graft. He also finds it difficult to anesthetize a second time, though if the patient is told it is to be done in two stages, it may be performed. He thought Dr. Pischel's flap a very good one. All these wounds are closed at the time of operation.

PAPER:

REPORT OF A CASE OF MASTOIDITIS AND TEMPORO-SPHENOIDAL ABSCESS.—OPERATION.—RECOVERY.

SEYMOUR OPPENHEIMER, M. D.

While cerebral abscess, the result of middle ear and mastoid suppuration, is one of the least frequent of the various complications, it is also undoubtedly in many cases the most difficult to recognize, especially in its early stages and when so situated that localizing symptoms are absent.

In the development of the temporo-sphenoidal pus collection, several factors of great practical importance are concerned in the transmission of the infection from the roof of the tympanum, or antrum, to the cerebral interior, inasmuch as there may be a direct line of infection through the tegmen and readily demonstrated on operation, or in other cases, no macroscopic changes will be observed in the osseous separating wall, and the cerebral condition may thus be overlooked, until, following the mastoid operation, severe symptoms at a later period develop, or a fatal issue occurs and the abscess is discovered only at the autopsy.

When there is a direct sinus through the roof of the tympanum, as in the case here recorded, the dura becomes inflamed and thickened over a localized area corresponding to the necrosed opening in the bone or the dehiscence, should such be present, and a more or less extensive focus of exudation is formed on the surface exterior to the pus collection in the brain. An apparently healthy area of cerebral tissue may at the same time exist between the diseased dura and the cerebral abscess, or in another class of cases the dura may be the seat of a direct fistula formation in external relation, while internally it communicates with the abscess cavity if such be not encapsulated, while surrounding the fistulous channel in the brain coverings, a mass of plastic exudation is thrown out, closely limiting the spread of the infecting material.

On the other hand, in those cases where there is entire macroscopic absence of a bone lesion in relation with the abscess and in addition a layer of apparently healthy cerebral tissue intervenes, the source of the infection is undoubtedly through the various venous and lymphatic channels, with which this region is so abundantly supplied, while in a certain number of cases the infection makes its way along connective tissue strands, either by vascular routes or by way of prolongations of dural tissue through minute interspaces in the tegmen antri or tympani. Bearing these pathological changes in view, and at the same time taking into consideration the fact that the majority of abscesses in the temporal region of the cerebrum bear a direct relationship to the roof of the tympanic cavity and its adjoining chamber, the antrum, one obtains valuable data in connection with other symptoms more or less confusing that will aid in a great measure in deciding the presence or absence of the pus collection, and, even further than this, in materially aiding in its location.

The following case shows this to a not inconsiderable extent: D. G., a boy of 7 years. He has had a purulent discharge from the right ear for four years, following measles.

At first he received some local treatment, but as the discharge lessened and the hearing appeared to be but little impaired, this was discontinued. During this entire time, however, there was always a slight moisture in the canal, but no special annoyance was complained of until within the past four months, when he commenced to complain at intervals of two or three weeks, of slight pain in and around the ear and of headache, especially at night.

I then saw the case for the first time, and examination showed a fairly robust boy, with good appetite, bowels normal, skin clear, temperature 98.5 degrees, but the pulse only 60, full and strong. The headaches had become more severe within the past few days, and were more marked on the right side, extending down over the mastoid region. Pressure elicited the fact that the parietal region was decidedly more sensitive on the right, while slight pressure over the antrum caused the boy to flinch. There was a slight, brown, offensive discharge in the auditory canal, a small perforation in Shrapnell's membrane occluded with granulation tissue, while the posterior canal wall was somewhat swollen, but not markedly projecting into the canal.

On account of the slow pulse, which was quite marked for a boy of his age, and the lateralized headache in the presence of a chronic suppurative otitis and undoubted mastoiditis, the possibility of cerebral abscess was suggested, and careful search made for other symptoms, but nothing could be elicited that in any manner gave further information. As the cerebral lesion, if present, was on the right side, localizing symptoms such as the various forms of aphasia, disturbances of speech, or changes in the ocular muscles, would not be present, and any dependence upon such symptoms was, of course, not to be obtained. Of symptoms the result of increased intracranial tension, headache was the only one present, and, except for it being most marked on the affected side, was not in itself especially diagnostic, while other cerebral symptoms, such as vertigo, loss of memory, etc., were absent. Both the ocular muscles and eye grounds were normal, as was also respiration and digestion.

As it was essential that the mastoid be promptly opened, consent was obtained to extend the operative field if pathological changes were found, in order to explore and ascertain if any intracranial complications were present, and especially if a pus collection existed in the temporo-sphenoidal lobe. Under ether anesthesia, the radical mastoid operation was accordingly performed, and differed in no way from the average case except that the mastoid cortex was exceedingly dense for a child of this age. There was considerable osseous necrosis in the region of the aditus and antrum, although but little pus was encountered. On exploring the tympanic cavity, a sinus was found in its roof leading into the cerebral cavity, and when the necrosed bone adjacent to it was removed, the dura bulged into the opening. The opening was then enlarged with chisel in an upward direction, until the dura could be separated from the bone with a periosteal elevator and with the rongeur forceps the opening was increased in size over the squamous portion of the temporal bone, until the tegmen tympani had been entirely removed and a large area of dura was visible. The brain covering was studded in this area with unhealthy granulation tissue, but no sinus into the interior could be found after careful search.

A large V-shaped flap was then made in the dura, and a long, slender scalpel was used in exploring for the suspected abscess. At about three-fourths of an inch from the surface,

pus was encountered, and, a free incision being made into the brain substance, about one-half ounce of pus was evacuated. The opening was enlarged with dressing forceps, and a smaller amount of pus was still further evacuated, and the abscess cavity was then gently washed out, after which a gauze drain was inserted and the usual dressings applied. The dressings were then changed every other day for the first week, and there was but little discharge at any time, the general and local condition of the patient both being very good. Following this time healing rapidly took place, so that the child was about at the end of the second week, and the parts were completely healed at the end of the sixth week; the pulse becoming normal and the headache disappearing within twenty-four hours after the completion of the operation.

On account of the poorly defined symptoms of temporosphenoidal abscess in many cases, the diagnosis is often most difficult, and this is especially so in the early stages, when practically all symptoms may be entirely absent, while at a much later period, when intracranial symptoms become unduly prominent, great difficulty may again be encountered in differentiating a cerebral abscess from some other complication, such as a localized meningitis, for instance. It must be remembered that in children an uncomplicated mastoiditis may present such bizarre or severe symptoms that a brain abscess is seriously considered when the entire trouble is limited to the middle ear and mastoid tissues, although in such cases a slight localized meningeal congestion undoubtedly coexists.

PAPER:

HERPES ZOSTER AURIS.

DERRICK T. VAIL, M. D.,

Herpes zoster auris, or herpes zoster auricularis, is, judging from the meager reports found in literature, one of the rarest of diseases. A careful search through the Index Medicus and other sources at my command shows scarcely anything presented to the profession in America on this subject since Green's paper published in the Transactions of the American Otological Society in 1874. Prof. Gruber saw only five cases among twenty thousand aural cases of all kinds. The text books recognize the disease, but few authors mention any cases of their own. Politzer gives a page on the subject; Barr gives four lines; Buck, twelve lines; Roosa does not mention it. Dench gives two pages excellently describing the disease; Burnett gives three and a half pages and explains the disease fully; the American Text-Book of Diseases of the Eye, Ear, Nose and Throat, has three lines by one writer, four lines by another, and two lines by a third on the subject; Posey and Wright on the "Ear, Nose and Throat," give seven lines.

By herpes zoster auris we do not refer to the occurrence of a bleb or two, not uncommonly seen accompanying a severe suppurative inflammation of the deeper structures, but to the idiopathic form which starts as herpes and ends as herpes, presenting pain and the characteristic eruption as prominent symptoms and an uncomplicated picture of herpes.

CASE REPORT.—J. W., age 29, toolmaker by trade, a robust, well-nourished male, enjoying unusually good health, and presenting no striking evidence of a neuropathic predisposition, with a negative family history as regards nervous disorders, a negative personal history as regards the same, consulted me on February 24, 1902.

Present History.—Two days ago he came out of his workshop in an overheated state and stood twenty minutes in a cold wind waiting for a street car. Next morning he noticed

his right ear was stopped up, accompanied by slight twinges of pain in this ear. At 10:30 o'clock the following night, he had sudden severe pain in the ear, and at 1:30 a. m. the pain had increased to an unbearable agony. He dressed himself and walked a few squares to my residence, ringing me up. When I saw him he was holding his hand to his ear and rocking back and forth with pain. I naturally inferred that he was suffering from an acute attack of otitis media.

Examination revealed a normal drum membrane, but on the posterior wall of the auditory canal close to the membrana tympani was seen a large bleb slightly dark in color as if it contained serum and a small amount of blood. The probe test showed that the bleb was raised epithelium and contained fluid. Cocain and adrenalin were used and the blister incised, a painless procedure, evacuating a quantity of blood-stained serum. The pain was not relieved in the least. Further examination revealed an exquisitely sensitive mastoid. Temperature 98; pulse 72. Thinking that there must be some middle ear involvement, the canal was thoroughly sterilized and the membrana tympani incised at the lower posterior attachment to the annulus, a distance of 8 mm. No fluid presented and the canal was carefully plugged, and the patient sent home supplied with four quarter-grain morphin tablets with the instruction to take one and repeat in an hour or two if not relieved.

Next morning, February 25th, the patient's condition was unchanged excepting that he was worn out with pain, which had been unremitting. He had not slept at all—had taken the morphin tablets hourly without relief, the only effect being that they produced drowsiness. Temperature 98; pulse 72. The patient fainted while attempting to walk across the room. The auditory canal was dry, the membrana tympani injected along the line of incision, but no secretion was present. His pain was deep in the ear and over the mastoid. The mastoid region was very tender but not reddened.

Evening of February 25th.—Pain has lasted all day. Prescribed 15 grains trional to take at 10 p. m. and a saline purge ordered. The auditory canal was plugged with cotton, and the ear and side of the head were confined under a large mass of cotton with a roller bandage.

February 26th.—Patient slept some after taking the trional; feels weak and complains continually of deep-seated pain in the ear and in the mastoid region. Has an ashen color and

an anxious expression. Inspection shows a crop of ten vesicles over the tip of the mastoid and just below on the side of the neck, the lowest being the largest. The auditory canal is dry and the bleb on the posterior wall is drying up. The incision in the membrana tympani has healed. The posterior wall of the auditory canal is sensitive to touch, as is also the skin over the mastoid. Ordered salol gr. x, phenacetin gr. v, three hourly.

Evening of February 26th.—Pain less severe. The large blebs over the tip of the mastoid have coalesced and recent smaller ones are seen. Temperature 99.

February 29th.—Permitted to come to town in order to have a photograph taken of the ear. The appearance at that time is as shown in the photograph here presented. Feels weak and nervous, and complains of the pain.

March 1st.—Still has some pain, but is improving. The hearing is improving. The vesicles are smaller and wrinkled; the contents like thickened serum. Air enters the middle ear with a dry sound.

March 8th.—No sloughing. The eruption has dried up and a new scarf skin has formed under the dried eruption. There is paresthesia of the parts, but pain is no longer present. Patient feels well, hearing normal.

Three years later.—No return of symptoms.

An excellent description of the disease is to be found in Burnett's "Treatise on the Ear." He denominates the affection "Idiopathic Herpes Zoster Auricularis," and states that it is a distinct disease of its own class. His description, and, in fact, the description to be found in all sources available to me, mentions the eruption as occurring on the auricle itself, either the front aspect due to involvement of the auriculotemporal, a branch of the trigeminus, or on the posterior surface of the auricle, due to an involvement of the auricularis magnus, a branch of the third cervical.

Gruber has observed herpes of the auditory canal and membrana tympani accompanied by great pain and deafness, and states that he has no doubt that the herpetic eruption occurs in the mucous membrane of the middle ear, basing his supposition on the fact that it has been noticed on other mucous surfaces, notably the soft palate. Hartman, also, has observed the eruption on the membrana tympani.

In Dench's admirable text-book on the ear, we find a good description of the disease. He states that it is extremely rare and is essentially the same as herpes zoster elsewhere. In Politzer's text-book there is published a good lithographic drawing of a case in which the anterior surface of the auricle was involved, and a good description of the disease in question. He states "the situation depends on whether the herpes is caused by an infection of the trigeminus (the anterior surface), or the great auricular (posterior surface) or the ganglion belonging to these nerves." I think he refers to the otic ganglion (or Arnold's ganglion). He mentions pain as the prominent subjective symptom, and the characteristic eruption as the objective one.

Most authors mention fever as a symptom, but Politzer states that it is sometimes present. In my case it was absent.

Politzer and others have observed facial paralysis on the affected side. This would seem to indicate involvement of the otic ganglion, which I believe has a branch of the facial entering it. The facial palsy was only temporary.

There is a type of herpes zoster called "Herpes Zoster Gangrenosus Hystericus." Politzer saw such a case. The eruption was located on the tragus and antitragus, accompanied by excruciating pain and characterized by necrosis of tissue in the area affected, followed by deep ulcers and healing by cicatrization, resulting in deformity.

I wish to call attention to the unusual site of the eruption in my case. Neither the front nor the rear aspect of the auricle was involved, but the eruption occurred on the posterior wall of the auditory canal near the drum membrane and in the region of the mastoid tip. There is no case on record like it that I could find. That it was herpes zoster and nothing else, there is not the slightest doubt, for it ran a typical zoster course. Hay (1) of San Francisco, says, "So typical is the eruption of herpes zoster that among the frequently confusing appearances met with in other diseases of the skin, herpes zoster stands as a definite clinical entity."

Etiology.—I could find no authority among the great pioneers and teachers in otology who would any more than generalize on the etiology.

Dench (2) refers to the neurotic diathesis, dietary indiscretions, faulty assimilation, improper and insufficient food as remote causes, and taking cold and local irritation as exciting ones. Bruehl and Politzer mention lymph glandular enlargements in front of and behind the ear. The observation of the lymph glandular enlargement preceding the eruption and, therefore, entering in the etiology of zoster in other regions of the body, was first made by Barthelemy (4) in 1891, and has been corroborated by Baudoin (5), Winfield (6), Howard (7), and others. Strümpell (8) has also verified this observation, and Hay (1) (whose excellent article I freely quote and whose citations I make free to use), states that "there seems no reasonable doubt that adenopathy precedes the eruption."

The work of Grindon (9) is notable, and worthy of mention. He endeavors to separate the secondary zoster from the true idiopathic type, and explains the former as being what he calls "zosteroids." By zosteroids he means any herpetic eruption which accompanies and is caused by a local pathologic state. The following are mentioned: (1) Chronic peripheral irritation; (2) traumatism; (3) pressure on nerve trunks (osteophytes, perineural infiltrations, perineuritis, adhesions); (4) infiltration of a nerve or ganglion from some neoplasm adjacent; (5) irritating substances, such as lactic or uric acid in the blood. The eruptions due to these and other like influences are according to Grindon to be called zosteroids.

Eliminating this group and also other known types, such as arsenical neuritis, etc., we still find a large number of cases that cannot be satisfactorily accounted for other than by assuming the presence of some infectious agent. The following arguments in favor of the infectious theory are advanced by Hay: "(a) The attacks occur more frequently in the spring and autumn months (Weis) (19). (b) It is more common in low altitudes. (c) The course is similar to other infectious exanthematous diseases. (d) True zoster rarely recurs; this seems to argue a certain immunizing influence. (e) The recurrent types are nearly always the so-called 'zosteroids.' (f) Family epidemics are reported (Jamieson) (10). (g) Bacteria have been found in a fatal case affecting the face, observed by Graham (11). (h) The constitutional symptoms are out of proportion to the local neuritis present (Unna) (12)." All these argue a general infection.

Neurasthenia has been credited with causing zoster, but in hysteria, mental worry, etc., Cabot (14) states that the blood count is normal, while in zona, leucocytosis is demonstrable. Hay advances this argument to show that hysteria is not the cause. He does this to clear the way for the infectious theory and thinks that the neurotic manifestations are the result, not the cause of zoster. The "hysterical herpes zoster gangrenosus," Van Harlingen (13) states, is not true zoster, but a simple local gangene. The eruption on one side of the body with the symptoms of general infection, like general lymphadenitis, seems to strengthen the theory of infection as the cause. Those cases of zoster following an injury may be due to the entrance of the specific infection through the infected part, because Rosenbach and Kast (15) have shown that wounds kept aseptic are not allowed by zoster eruptions. The curious fact that only a single nerve tract is involved in zoster, seems at first to be incompatible with the infectious theory, but in arsenical and coal-gas poisoning, there is but a single tract involved, and yet there is in each of these a profound systemic poisoning.

A careful microscopic examination of a lymph gland extracted from a zoster case, under the most rigid aseptic precautions by Hay (1), demonstrated the presence of a large number of micro-organisms, evidently pathologic, but not classified and many unknown thread-like bodies. This finding argues in favor of the infectious theory.

Osler (17) mentions herpes as occurring in trifacial neuralgia, cerebro-spinal meningitis, febricula, malaria, pneumonia, and typhoid fever; but these are not the idiopathic forms of zoster. Writing of true zoster, he states: "The researches of Head and Campbell make it possible that herpes zoster is an acute specific disease of the nervous system, with localization in the ganglion of the posterior roots." I have been impressed in my observation and study of this disease, that the true types of zoster are essentially ganglionic in origin.

We note in the herpes zoster ophthalmicus, that the affection is probably ganglionic, and in this, my case of herpes zoster auris, there was probably an inflammation, due perhaps to infection in the ganglion that exist on the sensory root of the third cervical or some ganglion supplying nerves to the region affected. If the otic ganglion had been implicated, we would

have had the pinna involved with eruption, associated perhaps with facial paralysis.

Pathology.—Bärensprung (16) first demonstrated an inflammation of the ganglion in the sensory root of the spinal nerve in zoster, and Osler (17) states that there is an acute hemorrhagic inflammation in this ganglion. "There are hemorrhages and inflammatory foci, with destruction of certain of the ganglion cells." On the other hand, Dubler (18) demonstrated a peripheral neuritis with entire absence of central disease, while other observers have found interstitial neuritis and perineuritis.

CONCLUSIONS.

1. Herpes zoster auris is like true zoster elsewhere, a definite disease usually running an acute course.

2. Herpes zoster auris is very rare, but has been observed by a number of noted authorities.

3. It may involve the membrana tympani, as well as deeper parts of the auditory canal.

4. Herpes zoster is most likely an acute infectious disease, causing neuritis, the storm center being in the ganglion of a sensory nerve.

5. Lymphadenitis is almost invariably present and probably precedes the attack.

6. Treatment is of little avail; the disease usually runs a rapid course and heals spontaneously.

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DISCUSSION.

Dr. E. M. Holmes recited a case which he had 8 or 9 years ago where he was called at night to see a woman 30 years of age with a perfect past history. She had been suffering pain for two hours in her left ear; it was intense and neurotic coming on in paroxysms. Examination of the ear showed nothing abnormal, and the canal looked normal. The nose and throat were negative. He thought it might be a reflex from a tooth, but they were perfect and the only explanation along that line would be the so-called pulp stone which could not be differentiated. The Eustachian tube was catheterized with the head forward. She was given quite an amount of morphin during the night, but she had the pain the following day. Heat and cold were tried without effect. In 36 hours a bleb occurred at the outside portion of the canal, and that afternoon there were several. The pains subsided after a few days and then again occurred. Three months later she had a general herpes extending over several intercostal nerves. This patient was seen within a year. The doctor was surprised to find a condition so rare beginning in the ear the cause for which he was unable to find. He thought the ganglion theory rather a hard one to prove

Dr. Wendell C. Phillips was of the opinion that herpes appearing about the ear was perhaps almost as common as the same affection appearing in other parts of the body. It was seen with comparative frequency and he has often observed it in the large clinics over which he presides. So far as his clinical experience went, herpes appearing about the ear was exactly the same as when it appeared in other parts of the body.

Dr. D. T. Vail, in closing, said that since writing the paper he had seen a number of cases of herpetic manifestations about the ear, where deep seated infective processes were at work. He agreed with Dr. Phillips that herpes was frequent in clinics but they all came from suppurative disease of the ear, and

such cases should be classified as "zosteroids" and not true herpes zoster. The case reported by Dr. Holmes he thought was one analogous to his own. His principal object in writing the paper was to call attention to a neglected chapter in otology.

PAPER:

GENERAL PATHOLOGIC PROCESSES ASSOCIATED WITH OR FOLLOWING INFECTIONS OF THE ACCESSORY SINUSES.

By D. Braden Kyle, M. D.,

Pathologic alterations of the structures of the accessory sinuses may be divided into two classes, according to the tissues involved: First, we have the changes affecting the mucous membrane alone, and, second, those involving the deeper structures or bony framework.

The accessory sinuses are, for all practical purposes, closed cavities, and while the mucous membrane lining these cavities is similar to that of the upper respiratory tract, yet the glandular elements and the terminal nerve filaments are not nearly so numerous as in the exposed mucous membrane. The epithelial layer of the membrane is also much thinner and the cells resemble more those of the endothelial type, and the mucous membrane, therefore, has less resisting power.

Inflammatory processes involving this structure do not differ from those occurring in any other mucous membrane, with the exception that they pass through the various stages with greater rapidity, so that the difference is merely one of degree or intensity. Any infection of the accessory cavities would necessarily be preceded by or associated with some inflammatory process, which process involves the opening of the sinus and thus converts it into a closed cavity, causing retention of the infectious material. This in turn intensifies the already existing inflammation and produces rapid changes in the mucous membrane, which, if drainage is not established, may lead to total destruction of the membrane and necrosis of the underlying bony structure. If the severity of the inflammatory process is not sufficient to cause destruction of the mucous membrane and denudation of the bony walls of the cavity, a fibroid formation within the basement membrane

may take place, or in other words, the physiologic function is interfered with, resulting in permanent pathologic alteration.

When there has been a destruction of the mucous membrane lining these cavities, it is not likely to be regenerated, owing to the fact that the blood supply to the submucosa is not so profuse as in the respiratory tract, and also that the genetic layer of the epithelial surface is less substantial and less capable of reproduction.

I have observed in a few cases, where the accessory cavities had been freely opened, that the pathologic alteration accompanying the process had not produced a permanent lesion, and when the cause was removed the mucous membrane returned to the normal, but the practically closed cavity had been converted into a wide-open one and the patient suffered from symptoms almost identical with those of confined suppuration of these cavities, such as faceache, the neuralgia, sense of pressure, the general discomfort with, of course, no rise in temperature. One of these cases in particular, I have watched for the past three years. This individual had six accessory cavities opened and the delicate, sensitive mucous membrane, which was not physiologically intended to come in contact with the air and dust, was particularly susceptible to the slightest climatic changes. It was found by placing the patient in a room with an even temperature, that almost instant relief was obtained, and I believe that all the symptoms were produced by the use or misuse of these sinuses, as they are not intended as respiratory cavities. By stimulation following the use of these cavities, and the increase in the blood supply of the exposed mucous membrane as a result of this stimulation, the membrane has gradually thickened and, in other words, has physiologically changed, and while it may be somewhat of a pathologic process, it has produced a physiologic result and lessened the sensitiveness of these cavities and developed the membrane. During the past winter the patient has had practically no symptoms of any involvement of these sinuses.

As a rule, confined suppuration within the accessory cavities show irregular systemic symptoms, unless there is a point where the physiologic wall of the closed cavity has broken down, and rapid general septic infection takes place, when the clinical phenomena are pronounced. In other words,

infection of the accessory cavities amounts to a walled-in process, and it is only when necrosis takes place that systemic infection occurs.

Infection of the accessory cavities is usually secondary to or associated with lesions of the adjacent structures, and in a large majority of cases, the etiologic factor may be found in the nasal cavity. The continuation of the pathologic process within the accessory cavity will depend entirely upon the pre-existing condition within the nasal cavity. While the pathologic alteration occurring within the cavity is a definite and distinct one, the arrest of that process is subject to the same general law which is the basis of all surgical treatment, namely, the removal of the cause. If the infection is due to the pneumococcus, streptococcus or bacillus of influenza, there is a marked tendency to bony necrosis.

A point of considerable importance, as regards the invasion of surrounding structures by the pathologic process, as well as accounting for the varied symptoms produced, is the size and shape of the cavity and the variations in the thickness of its walls. For example, a frontal sinus with thin walls may result in perforation and involvement of the brain cavity. Dural and subdural abscesses frequently follow pathologic changes within the frontal sinus. Again, in the case of the antrum of Highmore, where the superior wall is very thin, you will have marked eye symptoms, while in another case with a thick bony wall, the eye symptoms will be entirely absent. The spreading of an infectious process from one accessory cavity to another is usually explained by some abnormal communication.

Irregularities and abnormalities as to the formation of the accessory cavities, the antrum, etc., may explain many of the peculiar and unique cases often reported. It has been shown by sections of the skull, with a view to demonstration of the relation of the accessory cavities to the nasal chamber, that almost any size or shape of cavity or thickness of bone is possible, the antrum cavities varying in size from a little larger than a pea to three times the usual size and extending under the floor of the nose.

In cases associated with nasal lesions, it is quite likely that the chronic inflammatory process set up in the floor of the nose may interfere with the nervous and vascular supply of

the tooth directly under it, causing a trophic function with devitalization.

Recent clinical observations have clearly proven that many lesions of the head and face suggesting antral disease, the cause of which has been more or less obscure, have their origin in abnormal or pathologic conditions of the dental organs, such as teeth irrupted into the nose or antrum, or diseased teeth affecting either cavity.

Irregularities in the formation of the accessory cavities will bring about irregularity in the upper arch and predispose to dental lesions as well as nasal disease. This is not only caused by nasal obstruction and improper passage of air, but also by poor nutrition, as the current of air passing to and fro in the nostril stimulates circulation in the nasal mucous membrane. One-half of the arc of the orbit is taken up by the accessory cavities and many eye symptoms are associated with or follow lesions of these cavities. Orbital abscess is secondary to disease of the sinuses, displacement of the globe may be occasioned by encroachment on the orbit by a distended sinus, and blindness may result from an involvement of the chiasm through the roof of the cavity or by an implication of the optic nerve as it passes through its foramen in the sphenoid, as a consequence of inflammation in the cells within that bone. A general orbital cellulitis may be occasioned by an acute perforation of any sinus. Edema of the lids is one of the most significant symptoms of disease of the accessory sinuses and is to be distinguished from the inflammatory swelling and thickness of the lid which results from cellulitis, as it is entirely non-inflammatory in origin. Paresis, and even paralysis, of one or more of the eye muscles may occur as a consequence of sinusitis.

The sphenoid and ethmoid cavities, being in reality nothing more than honeycomb cells, an infectious pathologic process occurring within these cavities is extremely likely to produce bony necrosis, if the infectious process is of sufficient severity to cause necrosis of the mucous membrane. The delicate bony structure is dependent upon its blood supply coming from the mucous membrane; this is not true of the frontal sinus and antral cavity. In the latter cavities the bone may be denuded of mucous membrane with no necrosis of the bony structure. In other words, bony necrosis is more

likely to occur within the ethmoid and sphenoid cavities. The pathologic changes in the sphenoid and ethmoid cavities, following infections, even after the cavities are opened, is more likely to continue than in the frontal or antral cavity. In the latter, better drainage can be established, and the infectious material can be more thoroughly eradicated; in other words, more complete surgical interference can be employed in the antral and frontal cavities than in the sphenoidal and ethmoidal.

Meningitis and sinus involvement is likely to follow frontal, ethmoidal and sphenoidal sinusitis. Occasionally, cases are seen in which infections of these cavities produce practically no symptoms.

I recall a case which came under my observation in 1899 and which I reported at that time. The patient, a woman of sixty years, after being indisposed for a few days, experienced a sensation of fullness on the left side of the nose, opposite the inner angle of the orbit. There was no pain, only a sense of uncomfortable fullness. There was a considerable discharge from the nose of a thin, watery secretion; the character of the secretion varied slightly in the morning, when it was thick and tenacious. There was a great deal of swelling over the face, especially between the eyes, which gave a peculiar facial expression, as though the eyes were wide set. There was not much tenderness on pressure over the swollen area. There was, however, some soreness at the inner angle of the eye over the region of the ethmoid cells. During the month of February, the symptoms first being noticed in January, the patient had quite a severe attack of epidemic influenza or la grippe. She was confined to her house about a month. During this attack there was practically no change in the condition of the forehead. The swelling remained about the same, and there was possibly a slight increase in the clinical phenomena. However, after the patient was able to be up, which was about the first of April, the swelling became more marked, especially under the eyes and on the left side in the region of the nasion, about an inch and a half above the base of the nose. There was considerable discharge from the nostril, possibly more pus-like, although nothing more than would be from an ordinary continued rhinitis. There was more soreness at this time, although not painful; the patient complained of malaise and a peculiar sick

feeling; there was marked general debility, and the patient seemed to be failing very fast in general health. Prior to this attack she had been in the best of health—had never up to that time even suffered from a headache. During the month of May the patient developed marked swelling in the limbs—in fact, all the symptoms were aggravated; there were sore spots here and there over the limbs, with some petechiae and slight inflammation. There was constant shifting of these spots. There were pronounced aching about the joints and symptoms of a decided rheumatic condition or gouty diathesis. There was very little change in the swelling of the face; if any difference, it was more marked. At no time was there any acute pain, the prominent symptom being the edematous condition. The patient had lost over thirty pounds in flesh, and was quite weak and debilitated. The last of June she consulted me, when I found the following conditions present:

The tissue on the forehead was so swollen that it hung down over both supraorbital ridges, with marked swelling under both eyes, especially the left, giving the patient's face a most peculiar appearance. In the median line, about an inch above the line of the supraorbital ridge, was a marked projection, almost tumor-like, with distinct redness, and somewhat pitted in the center, with a small spot on which there was some dried secretion. On examination of the nose I found practically no discharge on the right side, only a slightly catarrhal inflammation; the left side was markedly edematous; the mucous membrane was covered with a thin glairy discharge with tendency to accumulation. The upper part of the nostril was so edematous and swollen as to completely occlude the cavity. This tissue was depleted by the local use of an 8 per cent solution of cocain, and after retraction of the tissue I could elicit no discharge from the openings of any of the accessory cavities. After the use of the cocain, there was perfect breathing through the nostril. There was practically no pathologic alteration within the nasal structure, the septum being almost straight, and there was enlargement of the turbinal bodies or lining membrane. Transillumination was resorted to, from a diagnostic standpoint, and the antra showed a perfectly clear outline. I was unable to make any satisfactory illumination of the frontal sinus or of the upper portion of the nose; however, I believed I

had to deal with a confined suppuration in the left frontal sinus, or possibly involving both sinuses. In passing a probe over the skin at the point bulging with pitting, on removal of the slight crust formation I found that the necrotic tissue had given way and the abscess was already opened externally. On pressure, and by the patient leaning forward, there was a discharge of foul-smelling thick pus, and by slight digital examination I found that there was a necrotic area, almost circular, about three-fourths of an inch in diameter. I then passed a probe into the opening, and, allowing it to follow the line of least resistance, it passed down without any force whatever, until it lodged against a soft material. By tapping it gently I felt that it was necrotic bone. With a little pressure the probe passed through into the nasal cavity. At the same time light was reflected into the nostril, and the point of the probe could be seen on the septum side of the middle turbinate, about the middle third. I then had free drainage. After the discharge of pus the sense of fullness at the inner angle of the orbit, which had continued from the first, entirely disappeared. The cavity was flushed out with warm boric acid solution, followed by hydrogen peroxid, cinnamon water and aqueous extract of hamamelis, equal parts. Within forty-eight hours the swelling had entirely disappeared from the face. The time from the spontaneous opening of the abscess until the complete closure of the wound was about two months. Occasionally, the external opening would become occluded with dried secretion with slight return of the facial swelling; on reestablishment of drainage this quickly disappeared. The patient's general health was improved by internal medication. Urinary examination showed no structural lesion of the kidney, but some leakage of serum albumin, possibly from the relaxed blood vessels.

From a general pathologic standpoint, we should remember that the accessory cavities are truly such and that they are not independent cavities; that they are accessory cavities to what? to the nasal respiratory tract. Hence, the origin of many pathologic lesions is the nasal cavity. We must remember, also, that these accessory cavities are dependent upon adjacent structures for nutrition. Also, when infected, you are dealing with a closed cavity, but not a cavity of new formation, hence the pathologic alteration is not subject to the same law as that of a cavity of new formation.

DISCUSSION.

Dr. E. M. Holmes said that the destruction was due to the fact that a bony wall cavity is present with little elasticity. One has not only the secretion that is set up, but the inflammation may be due to the closing of the natural opening and thus advance. When the secretion is serous or purulent, if pressure is started there would be a hindrance to the circulation. If an early diagnosis can be made and a small opening sufficient to give vent, a great advance would be made. This cannot be done in many of the ethmoid cells. We are not sure of many things, but he has been able in many cases of accessory sinus disease to gain a great deal by using the trocar to give vent.

Dr. Derrick T. Vail had a practical suggestion to make in meeting the symptoms patients complain of after operation, that is, the wearing of cotton or wool in the nose. The nasal cavity is suddenly opened by the operation, and there is an influx of air where there was none before. After an intranasal operation there is a fine garden spot for infection, and these areas should be protected with cotton or lamb's wool, especially the latter, as it does not become so saturated. Regarding headaches, Guye of Amsterdam brought out an excellent point. He says that the swelling of the mucous membrane which accompanies the primary stage of rhinitis causes the openings in the cavity to close, and this guards it against infection, but the very fact that these openings are closed, prevents ventilation, and the air present will soon be resorbed, causing a vacuum and venous congestion. In this way headache results. This is a good point, and would argue that no attempt should be made to produce an opening. The speaker also admits that in his own case, when he has an attack of acute rhinitis, he prefers to leave the nasal cavity alone and wait until the disease runs its course. He has endeavored to relieve some of these headaches with success with Politzerization after cocain and adrenalin. It gives instant relief, but there is danger of carrying infection into the sinuses, and Dr. Vail does not recommend it.

Dr. H. W. Loeb thought that Dr. Kyle had brought out one very important point with reference to the physiology of the sinuses, particularly the sphenoid, ethmoid and frontal. He thought we were much inclined to consider certain parts of

the nose as extensions of the respiratory portions of the nose, when they belong to the olfactory region. He thought it important to consider the possibility of removing too much of the sinus walls.

Dr. Joseph Beck said in connection with the pathology of the sinuses that one can judge by associated symptoms with the pathology, and he spoke of the diagnostic features of the radiograph. Where a patient has the symptoms of intense distension as though the antrum was distended and possibly filled with pus, transillumination would produce a darkness on that side. When this does not work he introduces a film into the nasal cavity and takes a separate radiograph of the nose; there is then an absolute difference in the shadow when there is marked thickening of the interior of the cavity, especially the bone, so that the X-ray will demonstrate the pathologic condition easier through the lateral walls of the nose.

PAPER:

THE MEDICAL TREATMENT OF TUBERCULOSIS OF THE UPPER AIR PASSAGES AND THE EAR.

WM. C. BANE, M. D.

The medical treatment is naturally considered under two heads: Constitutional and local.

1. *Constitutional*:

Theoretically, much might be hoped for by systemic medication, but, unfortunately, comparatively little is accomplished. New remedies are brought to our attention from time to time, and lauded as cures of the white plague, only to be found wanting when put to the test. The drugs that aid in stimulating the appetite for food, and the enriching of the blood, do accomplish much in assisting nature in overcoming the disease. Experience has demonstrated that strychnin is the best stimulating tonic for tubercular patients

The hypoposphites have some value, and may be combined with strychnin.

Certainly the most efficient destroyer of the tubercle bacilli is rich blood. Hence the importance of a full nourishing diet of meats, eggs and milk, supplemented with emulsions and fats. Creosote and guaiacol have a value in stimulating an appetite and toning up the system. They can be combined with malt or some of the oleaginous preparations. Calcium chlorid is given by some physicians with the idea that it has a beneficial effect in overcoming the disease.

Forced feeding, coupled with rest to the system, is very important in aiding nature to combat the disease. The cough should be kept in abeyance in order to give rest to the diseased parts, particularly the larynx, and this is best accomplished by some of the alkaloids of opium, as codein or heroin. Not only does the codein quiet the cough, but it aids very materially in relieving the pain, both very important points in the treatment.

2. *Local*:

The local treatment of tubercular laryngitis depends upon the stage of the disease and the amount of destruction that

has taken place. Likewise, upon the object aimed at, i. e., whether palliative or curative. In the far advanced pulmonary cases, with marked destructive changes in the upper air passages, but little more than palliative treatment is to be considered. But in the cases of infiltration, or even ulceration, with fair condition of the lungs, vigorous efforts should be put forth to check the local disease.

Whether the disease be in the nose, pharynx, larynx or ear, it is desirable to keep the surfaces as free from mucopurulent secretion as possible. As a cleansing solution, and at the same time possessing some anesthetic properties, I am partial to a 4 per cent solution of resorcin. It can be used freely by the patient at home.

A 1-1000 solution of alphozone is an excellent preparation for cleansing the larynx. Being germicidal and but slightly irritating, it can be freely used.

The most efficient remedy up to the present time is formalin, whether in the filtrative or ulcerative stage. It is irritating to some patients, but the irritation is only transient. Formalin is decidedly germicidal in even a weak solution, and serves for not only cleansing the larynx and pharynx, but in a comparatively strong solution, 1-500 to 3-100, for direct application with a swab to the diseased areas. In most cases the formalin, in strong solution, should be preceded by the application of a 5 to 10 per cent solution of cocain or eucain B. A 3 to 5 per cent solution of formalin has a decided beneficial action on ulcers of the larynx, and may be applied to granulations about the epiglottis and vocal cords. It causes shrinking and hardening of the tissues, thus encouraging fibrous changes.

Lactic acid is a local remedy of value in the ulcerative stage when it is desirable to destroy tissue. Dr. L. B. Lockard* of Denver has had a very large experience with the local use of formalin in tubercular laryngitis, and he regards it as superior to all other remedies. I wish to state in this connection that I am indebted to him for his views on the treatment of tubercular laryngitis, and have embodied some of them in this paper.

The essential oils have some value, yet when used in sufficient strength to avail much, they act as irritants. Their principal value is in overcoming the fetor, in part.

*The Laryngoscope, October, 1904.

Possibly the best instrument for the patient to use for cleansing the nose and throat is the Devilbiss No. 16. It is easily handled and can be readily sterilized.

For local anesthesia, there are several drugs at our disposal. Eucain B in a 5 per cent solution has a good effect and interferes less with local nutrition than cocain. It is less toxic than cocain. A safe and most efficient local anesthetic is orthoform applied by insufflation with boric acid, or in an oil. Dr. Lockard recommends a mixture of orthoform, viz.:

Orthoform .....grs. xv.
Menthol .....dr. j.
Ol. olive .....oz. j.
Inhale for 5 or 10 minutes every 2 to 5 hours.

The medical treatment of nasal or pharyngeal lesions is that outlined for the larynx. Where the tonsils are involved it is necessary to swab out the crypts thoroughly with a solution of formalin or lactic acid. A very strong solution of alphozone also meets the indications. We perhaps pay too little attention to the tonsils in tubercular patients. It is certainly true that one source of involvement of the cervical glands is through the tonsils and connecting lymphatic vessels.

The ear is invaded insidiously, and as a rule without pain. Too much care cannot be taken to prevent the tuberculous mucus from entering the Eustachian tubes. The manner in which many people blow the nose tends to force the infected mucus into the tubes. The cleansing of the vault and nose with a germicidal spray is very desirable to avoid involvement of the ears. In the early stage or that of infiltration and maceration, the hearing being impaired, and a full feeling experienced, without pain, the patient seldom applies for aid, except when one ear has already been damaged. In this stage an effort should be made to empty the tube and middle ear by suction and medicated vapor, as of iodin and menthol, gently forced into the middle ear. After rupture of the membrana tympani has taken place, it is desirable to keep the canal and middle ear as dry as possible. The patient should be taught how to dry the ear with cotton on a cotton holder. Once every second or third day, the canal, ear and tube may be treated by instillation of a 3 per cent solution of formalin, preceded by a 5 per cent solution of

eucain B. I do not favor frequent irrigation of the ears in these conditions. They do best under a comparatively dry treatment. The long and faithful carrying out of the above line of treatment will bring about a dry condition of the ear and check the tuberculous process, if the general condition of the patient has improved. The hearing is usually permanently impaired.

In Colorado, we see a class of patients that are practically well of their pulmonary disease, yet in whom the hearing in one or both ears is impaired. The drum membranes contain one or more perforations of varying size. There is a varying amount of secretion that is thrown out from the middle ear and dries on the edges of the perforation, and in time covers it. These patients consult us at irregular intervals to have the dried masses removed. When left too long, maceration beneath the mass occurs and the ear becomes foul. We find it best, as a rule, to loosen the edges with some form of liquid before attempting removal. The instillation of eucain B followed by formalin, will in time check the secretion and effect a cure.

Occasionally the subacute destructive process progresses and there results a loss of the lining of the middle ear and necrosis of the promontory. The medical treatment in such cases is mainly that of keeping the parts clean.

When the diease invades the mastoid much can be accomplished by irrigation with alphozone, and the external application of ichthyol and glycerin. While I have seen a goodly number of tuberculous ears, the cases with pronounced involvement of the mastoid have been very few indeed. Not over 3 per cent of my operations for mastoiditis have been on cases of tubercular origin.

PAPER:

SURGICAL TREATMENT OF TUBERCULOSIS OF THE UPPER AIR PASSAGES AND THE EAR

ROBERT LEVY, M. D.

No subject in medicine possesses a more extensive or interesting history than tuberculosis, nor can any disease boast of more attempts at solving the problem of its treatment with less permanent, definite and satisfactory results. Still out of the mass of suggestions for more or less radical lines of action, it cannot be denied that progress has been made and that many cases are cured, many more are improved and a large number are given an increased and comfortable longevity. This is true of tuberculosis generally, but it is particularly so of tuberculosis of the upper air passages. To go back more than a few years into the history of the treatment of this affection is only of literary interest. The only practical result which followed the enthusiastic advocacy of innumerable remedies and methods of treatment was an occasional valuable advancement. By the errors of overenthusiasm, however, we have profited to the extent of being better able to definitely and intelligently apply certain modes of treatment, and in no field of our science is this more marked than in the surgical treatment of tuberculosis of the throat, nose and ear.

It cannot be claimed that the extravagant hopes of the fathers of the operative management of tuberculosis of the upper air passages have been fully realized, but the twenty years which have passed since Krause,[1] 1885, and Heryng,[2] 1886, promulgated their views have unified to a great extent the views of laryngologists, and the pendulum is now swinging near a more rational plane. The name of Herman Krause is indissolubly associated with the lactic acid treatment of tuberculosis, and that of Heryng with operative measures. These two methods have, however, always been closely associated, and consequently the Krause-Heryng method covers more nearly the surgical treatment.

Included in this term, so far as the upper air passages are concerned are, first, deep incisions; second, curettage.

third, excision; fourth, galvanic cautery; fifth, tracheotomy; sixth, laryngectomy. So far as the ear is concerned, operative treatment includes the same measures that are applied to chronic suppurative processes of non-tuberculous origin. These surgical procedures have, however, certain limitations which are always largely controlled and modified by the character of the lesions, their nature, extent and complications, and also by their primary or secondary development. Thompson states that "we must look elsewhere at present than to surgical measures for a prospect of progress in the treatment of tuberculosis of the larynx. This progress is ready to hand in the making of an earlier diagnosis of local infection."[3] The early diagnosis, therefore, adds another extremely important limitation to the surgical management of these cases. This is true not only of the larynx, as Thompson announces, but it applies as well to the ear.

Tuberculosis of the Ear.—This may be considered as a form of chronic suppurative otitis media with possibilities of all the complications with which we are familiar. Its nature differs in that its attack is slow, insidious and attended at times by very extensive destruction, due in large measure to the lowered resistance of the tissues. All cases of chronic suppuration of the middle ear in tuberculous individuals must not be considered tuberculosis, but whether tubercle bacilli are found or not does influence the indications for surgical measures. The vast majority of suppurative processes in the middle ear occurring in tuberculous patients do not go on to destruction of bone; therefore, surgical measures have but limited usefulness. Politzer[4] advises operation for tuberculous diseases of the petrous bone when pulmonary tuberculosis develops in the course of a long standing suppuration of the middle ear, while he advises against operation when the disease of the bone comes on in the course of a well-established pulmonary lesion. Milligan[5] advises operation when the extent of the disease is not too great and the general condition of the patient not too hopeless. The objects to be obtained are the removal of all available foci of the disease and the establishment of efficient drainage. These two views should form a basis upon which to build our indications for treatment.

Given a patient whose general condition is fair, whose temperature and pulse do not indicate rapidly progressing

disease, whose hygienic, sanitary and social surroundings are favorable and whose ear lesion consists in destruction of bone, an attempt should be made to remove it by surgical measures. The nature of the operation will depend upon the site and extent of the lesion. If ossiculectomy will suffice it should be performed, followed by careful curettage and the application of lactic acid and antiseptic irrigation. If the mastoid be involved, a radical operation is indicated. Under all circumstances the two important considerations to be borne in mind are the removal of diseased bone and the establishment of free drainage.

Tuberculosis of the Nose.—This is of rare occurrence. It is usually seen in the form of ulcerations or new growths, so called tuberculomata. When seen early, surgical measures are followed by surprisingly good results. Ulcerations should be thoroughly curetted and lactic acid freely applied. Tuberculomata should be removed by the cold wire or galvanic cautery snare. This should be followed by thorough curettment, after which lactic acid should be freely applied. The nose responds more satisfactorily to surgical treatment in these cases than any other portion of the upper air passages. This is due to the fact that tuberculosis of the nose is seen early, that the lesion is usually limited and that it occurs as a manifestation of the more chronic forms of the disease unattended by high temperature and rapid pulse.

Pharyngeal Tuberculosis.—As a rule, all the conditions which contraindicate surgical intervention in tuberculous processes exist when the pharynx becomes involved. The disease is a manifestation of a rapidly progressing, acute process. It is associated with high temperature and rapid emaciation. It accompanies the most asthenic form of tuberculosis. Its local manifestations are scattered and spread rapidly and widely. When we see a solitary circumscribed ulceration in any portion of the pharynx in a tuberculous individual, it is well to question its tuberculous character. In the writer's judgment, the curative value of any surgical procedure for tuberculosis of the pharynx is so limited that it may be practically discarded. As a palliative remedy, operative measures possess some virtue.

The particular forms of surgical intervention that are applicable are curettage and galvanic cautery. After thoroughly cleansing the ulcerated surface and applying 20 per cent

cocain solution, the galvanic cautery or the curette may be freely used. The writer prefers to do as much at one sitting as possible. The after-effect may be rather severe for a few days, but not much more so if a large surface is operated upon than if the surface is limited. The relief to pain is usually sufficient to justify the procedure. The shock to the patient is moderate and is distinctly less than when frequent operations over small areas are performed. The rationale of surgical measures where only palliative results can be expected depends upon the histological research of Danzac,[6] who found that the pain in tuberculous ulcerations was due to a "proliferation of the terminations of the peripheral nervous filaments—a veritable neuroma of regeneration." By destroying this proliferation or nervous tumor, much of the sensitiveness is relieved.

Laryngeal Tuberculosis.—This is the most common complication of pulmonary tuberculosis, and in as much as primary lesions of the upper air passages are extremely rare, if they ever occur, laryngeal tuberculosis is the form that has more generally attracted our attention. It occurs early and late in the disease, is attended with symptoms barely noticeable, as well as of such severity that the laryngeal complication is the most important manifestation of the disease. When, therefore, Krause and Heryng advocated so strenuously and with such a good showing surgical treatment, this method was hailed with delight and applied heroically and with great radicalism. Time, however, has shown that like all other remedies, operative intervention in laryngeal tuberculosis has its usefulness, but also its abuses. Each form of surgical procedure has its particular advantage.

Deep Incisions.—This procedure is particularly useful when there exists pronounced edema or extensive, uniform, smooth infiltration. The value of incisions in edema is seen in marked shrinking of the swelling and relief in many instances, to difficult, not necessarily painful delugtition and to respiratory distress. In cases of uniform, pale, more or less firm infiltration, deep incisions are principally useful as an auxiliary measure to the thorough application of lactic acid. In this connection one might refer to the submucous injections of lactic acid, creosote and other preparations, as advocated by Major,[7] Chappell[8] and others. Such injections, however, are but mild imitations of deep incisions followed by friction with lactic acid.

Excision.—This is a true surgical manipulation and is an ideal method of operating upon tuberculous deposits. As such, its application is limited to those cases in which there is a certainty or a strong probability of completely removing the entire focus of disease. It is here, however, that we must face the most discouraging feature. The diagnosis is rarely made so early that a limited involvement of tissue, well circumscribed, manifests itself. The character of the lesion as well as its early recognition also offers an opportunity for this surgical measure. The true tuberculous tumor is frequently and fortunately among the earliest laryngeal manifestations.[9] It is more likely to be well localized and is readily extirpated. The infiltrative or hypertrophic tuberculous manifestation usually invades surrounding structures to such an extent that its extirpation would be a practical impossibility. Not infrequently, however, the epiglottis or a portion of the epiglottis is the principal laryngeal involvement. The tuberculous focus may be, in this instance, satisfactorily removed, the healing being often prompt and gratifying. However, one must be fairly certain that the tuberculous process is expending itself upon the epiglottis and not also upon contiguous structures, and too much stress cannot be laid upon the necessity of repeated and most careful laryngoscopic examination before an operation is undertaken. Even then it is in many instances absolutely impossible to determine the extent of the infiltration. Two specimens that I present herewith are good examples of two extremes. The first specimen is that of a well-defined circumscribed tumor which was located in the posterior commissure. Its removal was easily accomplished, and so far as the larynx is concerned the patient had no further trouble. The section as shown by the microscope confirmed the diagnosis showing the presence of numerous tubercle bacilli in the tissue. The second specimen shows extensive tuberculous infiltration and ulceration of the epiglottis, aryepiglottic folds, the arytenoids, the interior of the larynx and the subglottic region. A section taken from the trachea shows abundant tubercle bacilli in the tissue. This illustrates the difficulty and, in fact, the impossibility of determining the extent of the lesion microscopically. One would, of course, not advise the extirpation of so extensive a lesion as is seen here, but the conclusion is forced upon us that even though the infection involve a mod-

erate portion of the larynx, the naked eye cannot detect its extent when we consider how far in advance of the apparent lesion the infection in this case was found.

Curettment.—This procedure is probably the most frequently applicable of all surgical measures. It is indicated in ulcerations and soft excrescences. Tuberculous ulcerations may be classified into acute or active, and chronic or sluggish ulcerations. The acute ulcerations are usually associated with marked edema, extensive involvement of surrounding structures, high temperature and other manifestations of great activity in the tuberculous process. Curettage is here contraindicated. On the other hand, the form of ulceration which is sluggish, localized, attended with no marked edema or constitutional evidences of rapidly progressing disease, respond promptly to this surgical intervention. After thoroughly curetting, lactic acid or Lake's formula, of formalin, lactic acid, carbolic acid and glycerin, should be thoroughly rubbed into the parts. Healthy granulations are soon seen and the cicatrization of these ulcerations is a common result. Other ulcerations may develop and may be treated likewise. Repeated and extensive operations of this kind may thus be performed as various new ulcerations develop. Frequent cures have been reported, notwithstanding the involvement of much of the laryngeal structure. The salvation of this class is in the fact that the extensive involvement is not found at one time, but is developed progressively, each new development being met by the same radical surgical measure.[10] Thoroughness in this manipulation is essential. The curette should be strong, sharp and at the same time so delicately constructed that it may be applied to any portion of the larynx with ease. To meet these requirements I have for years used the accompanying instruments with much satisfaction. The soft papillomatous excrescences so frequently seen in laryngeal tuberculosis are readily removed by the curette. If, however, they are of a large size, Krause's laryngeal forceps may precede the curettage.

Galvano-Cautery.—This is an extremely useful method of bringing about cicatrization of small, easily accessible tuberculous ulcerations. It should not be used indiscriminately, nor can it be as extensively applied as the curette. The serious reaction following its use need only be feared where it is too vigorously and too extensively used.

Tracheotomy.—Notwithstanding an occasional, sporadic, enthusiastic advocacy of tracheotomy for the cure of tuberculosis of the larynx, it has never been accepted by the majority of laryngologists. Schmidt, I believe, still advocates placing the larynx at rest by this method, and its virtue was well demonstrated in a case of most extensive tuberculous disease of the larynx reported by McIntyre. It would seem that this operation might be justified upon rational grounds, but the dangers from the usual complications following tracheotomy, such as increased bronchitis and pulmonary irritation, must always be sufficient to deter one from accepting tracheotomy as a routine measure. It may possibly be of more value in children, as recently suggested by Finder.[11] His recommendation is based upon the difficulty with which intralaryngeal manipulation may be carried out in children. A number of years ago I tracheotomized a child for multiple papillomata of the larynx. The tracheotomy tube was retained for a considerable period of time during which the papillomata were being gradually removed. The child developed tuberculosis and died within a very short time thereafter. It always seemed to me that the tracheal opening favored pulmonary infection and assisted its rapid progress.

Laryngectomy.—This operation, partial or complete, will probably always be considered inadvisable in tuberculosis. So dangerous a procedure can only be considered when the disease is definitely localized. At such a time intralaryngeal methods are of quite as much avail and are not attended with the same dangerous possibilities.

SUMMARY.

First. The views of the majority of laryngologists regarding the surgical treatment of tuberculosis of the upper air passages have been unified in the past twenty years.

Second. Surgical measures are controlled by the character of the lesions, their nature, their extent and other complications, whether primary or secondary, and by the limitations placed upon the possibility of early diagnosis.

Third. All cases of chronic suppuration of the middle ear in tuberculous individuals are not necessarily tuberculous.

Fourth. The objects of surgical measures in tuberculosis of the ear are the removal of all available foci of disease, the

removal of diseased bone and the establishment of free drainage.

Fifth. Tuberculosis of the nose responds readily to surgical treatment, the methods used being curettment and excision by cold wire or galvanic cautery snare.

Sixth. Pharyngeal tuberculosis is a manifestation of the most asthenic form of the disease, presenting all conditions which contraindicate surgical intervention.

Seventh. Operative measures in pharyngeal tuberculosis are only of palliative value.

Eighth. In laryngeal tuberculosis, deep incisions are valuable in edema and in uniform, firm infiltration, their usefulness being increased by rubbing with lactic acid.

Ninth. Excision of tuberculous deposits is limited to those cases in which there is a certainty or a strong probability of completely removing the entire focus of disease.

Tenth. The extent of the involvement is often greater than can be determined by laryngoscopic or microscopic examination.

Eleventh. Curettment is valuable in ulcerations and soft excrescences. The character of the ulceration modifying, however, its applicability.

Twelfth. Repeated and extensive operations may be performed provided the lesions develop progressively.

Thirteenth. Galvanic cautery is useful in small, easily accessible tuberculous ulcerations.

Fourteenth. Tracheotomy may prove of value in children and is always indicated for the relief of dyspnea.

Fifteenth. Laryngectomy is probably never indicated.

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PAPER:

THE CLIMATIC TREATMENT OF TUBERCULOSIS OF THE UPPER AIR TRACT.

WOLFF FREUDENTHAL, M. D.,

It is an old and common experience that the majority of pathologic conditions are beneficially influenced by pure, fresh air. More difficult, however, is the answer to the question: in what affections can a marked relief or cure be expected by a change of atmospheric surroundings? The disease of interest to us in this discussion is tuberculosis of the upper air tract. Since we cannot separate those parts from the rest of the body, we should not ignore the condition of the lungs, which, as a rule, are also affected. On the other hand, it is my conviction, based on a considerable experience, that the diseases under consideration require a special climate in some instances.

First of all, it must be borne in mind that tuberculous cases are being cured in all parts of the world, i. e., in every possible climate. Still the difference, for example, between a high altitude and the seashore is so great in a physiologic sense that in pathologic conditions a beneficial or a deleterious influence might be expected from either of these localities; and, as a matter of fact, such influence for better or worse does exist under different climatic conditions, for you will all agree that some of your patients have done well in southwesterly altitudes, while they become worse when they return to their homes in the East. Why is it that these relapses occur so frequently? Is it because these people resume their old occupations? No! Some of them — women — have no vocation, while others follow their business in the West for many years without detriment. This is undoubtedly due to the influence of the climate, and in the following pages it shall be my aim to discuss briefly the treatment of tuberculosis of the upper air tract from a climatological view-point.

For the sake of convenience, I have thought it best to divide the subject into four parts:

(*a*) Aerotherapy.
(*b*) Heliotherapy.
(*c*) Altotherapy.
(*d*) Thalassotherapy.

(*a*) *Aerotherapy* is the treatment with fresh, pure air, which a priori we should be able to utilize everywhere, and in fact we do make use of it all over the world. What diet means in catarrh of the intestinal tract, aerotherapy means in catarrh of the air passages (Nothnagel); or, we may add, in tuberculosis of the air passages. If we take a patient away from his sweatshop, direct him to do half a day's work if he cannot give up work entirely, and let him spend as much time as possible in some park in the open air or, in smaller towns, in the fields, such a patient has actually changed his climatic surroundings. If necessary, his throat and nose can be treated at the same time, and in a number of cases we will be rewarded by a cure.

If the patient is somewhat better off and can stay away from business for several months, so much the better for him. We can then place him in a sanatorium nearby, or he can present himself at regular intervals for treatment. By far the great majority of all consumptives must be treated in that way, and I am sure there is not one physician in the United States who has not obtained cures in that manner.

The details of using air as a therapeutic means in tuberculosis are so well known that I need not dwell on this topic any further. However, let me ask you not to go into fads. The following case may illustrate what I mean: A well-nourished gentleman commenced to cough, and a diagnosis of incipient tuberculosis was made. Consequently he was ordered by his physician to stay in bed on a strict diet, to be massaged three times a day, and directed to have a tent built on his house opposite Central Park, in order to obtain more fresh air. These orders were carried out strictly for a week, when this gentleman and his wife were so exhausted from excitement, worry and lack of sleep that they told me they could not stand it any longer. On my examination, the condition of the lungs gave a reasonable doubt as to the correctness of the diagnosis, but there were present marked pharyngitis and laryngitis. I told the gentleman to eat what-

ever he wanted, to be out all day long and to have his throat treated. After eight weeks he had gained ten pounds in weight, and, having settled his business affairs, I sent him to the mountains. His cough had left him long before. I am convinced that this patient would have gone rapidly into consumption if the former method of treatment had been continued.

It is very true that a consumptive cannot get too much fresh air, but to suddenly transplant a person susceptible to drafts from a hot room in New York City to cold winter air day and night is irrational, to say the least. On the other hand, even in the best of climates patients often do not get enough air. Some people think that when they live in the open air while taking the rest cure, they have done enough. As you know, however, the gaseous exchanges are only partly carried on by the lungs, and a great deal is done by the skin. Hence, we ought to expose the skin as freely as possible to the air, since parts of the lungs are out of function. A sojourn outdoors brings one in contact with the movable air, which is an essential factor in stimulating the skin, and through it the organism, to renewed activity. This is also the reason why we should accustom our consumptives slowly to wearing as few garments as possible, and finally to take air baths with the naked body. With this we have reached the second part of our discussion.

(*b*) *Heliotherapy*.—The therapeutic use of the rays of the sun is older than medicine, but their action on the human organism has been explained scientifically only in late years. I need but mention the names of N. R. Finsen, W. Gebhardt, Möller and Schönenberger, and they will bring to your memory a great deal that has been achieved in that field.

While the direct rays of the sun have been chiefly employed in order to promote perspiration, nowadays a combination of the diffuse sun rays, with exposure of the naked body to the air, is being utilized with success. By exposing the whole body to the air not only is the exchange of gases through the skin accelerated, but at the same time, through the action of the sun, the metabolism is increased and finally a beneficial influence is exercised upon the nervous system.

Says Prof. Rieder of Munich: "The question has been brought up whether it would not be preferable to let the

patients go around naked in glass houses, instead of subjecting them to the fresh air cure, as is customary in sanatoria." This question has been answered in the affirmative by others, and I am personally very much in favor of such a combination, only I should advise that this cure should be carried out in the open air instead of in glass houses, as Rieder suggests (Handbuch der physikalichen Therapie von Goldscheider and Jacob, Bd. ii., p. 502, etc.).

That we can also use the direct rays of the sun for this treatment, I have mentioned on various occasions. Permit me only to repeat that one of the first directions I give to my patients is to stay in the sun as long as they possibly can; that is, in winter. In summer they are advised to rise with the sun and expose themselves to its rays. In warm climates, as well as in our own, this has to be done later in the day with more care and judgment. But even in the hot regions of Colorado, New Mexico and Arizona I have had patients working on ranches for many hours every day and they fared well. But not everybody can stand this, and we have to discriminate here as in everything else in medicine. We should remember that exposure to the sun does not act therapeutically through its intensity, but rather through its continuity. Too much exposure has a weakening, deleterious effect, and spoils the appetite, but taken in the right way it has done good in a general way. As to treatment of the upper air tract, I have noted some good effects in so far as relief of pain is concerned. As a substitute for the sun, the arc light has been used, and while it is not a panacea, it is nevertheless a good adjuvant to our armamentarium in such treatment.

(*c*) *Altotherapy.*—I have coined this word myself—at least, I do not remember having read it anywhere—to indicate treatment in high altitudes This treatment is of great, if not of paramount, importance to our tuberculosis patients. There are four features which characterize high altitudes:

1. The pressure of the air. This being highest at the level of the sea, gradually diminishes with the altitude, and with it likewise the density of the air.

2. The intensity of radiation of the sun. This (i. e., the rays of heat), on the contrary, increases with the altitude and level of the sea, gradually diminishes with the altitude, and independently of the heat of the ground.

3. The rays of light. Their intensity is also increased, and, according to Prof. A. Loewy of Berlin, it is especially the chemical, short-waved rays—the blue and violet—which are present in high altitudes and make themselves felt more strongly than at the level of the sea.

4. The temperature of the air. This diminishes with the elevation. Of course, that varies with the geographical latitude, and is due partly, as we know, to the decreasing density and diminished humidity of the atmosphere.

Now these atmospheric conditions prevailing in high altitudes have a more than merely perceptible effect on the human body under normal conditions. Can we believe that they are negligible in pathologic processes? We know that good work is done in sanatoria situated at the sea level, but does this imply that climate as a factor in the treatment of tuberculosis can be ignored entirely? If our home sanatoria were less careful in selecting by preference incipient cases or such where the diagnosis is still in doubt, one would see how quickly the mortality would rise. I have advocated the erection of sanatoria in and near New York, myself, and I know that for cases with slight local lesions, cases which are quite well nourished, they fill a great need. On the other hand, cases with marked anemia, febrile temperatures and irritations of the mucous membranes do much better in the mountains. This is also the experience of A. Fraenkel of Berlin (see his excellent work on Lungenkrankheiten, Berlin, 1904). Patients with much expectoration from the lower or upper air tract should be sent to a dry climate; while others, with a dry, hacking cough, do better in a moist climate.

In most of the text books, it is stated that tuberculosis of the larynx or pharynx is a contraindication to a sojourn in high altitudes, as it is a complication of pulmonary tuberculosis that retards or prevents the cure of the latter in these altitudes. Such and similar statements go from one text book to another and are accepted as truth. They are certainly not in accordance with my experience. Among my patients, there are some now living in New York City in good health and following their occupation for the last five and even ten years, who have been suffering from pulmonary and laryngeal tuberculosis (one with deep ulcerations in the lung). They were sent by me to Denver, Colorado Springs, parts of Ari-

zona and New Mexico, and were perfectly cured there in spite of their laryngeal affection.

The trouble is that a great many of these cases represent an advanced stage of the disease, with a derangement of one of the vital functions of the body, namely, digestion. I say digestion purposely. The tuberculous involvement of the larynx only in extremely rare cases interferes with breathing, i. e., with the respiratory tract; but too often when dysphagia is present it interferes with nutrition. Now to send a patient to a high altitude who has been debilitated by lack of food, whose heart is fluttering with every movement and who has not sufficient vitality to become acclimated to the new surroundings—that is like stretching a piece of rubber to see whether or not it will break.

On the other hand, there are quite a number of those afflicted with laryngeal tuberculosis who have enough vitality and energy to become accustomed to new surroundings, whose hearts will do this somewhat increased work without any damage, and whose dysphagia can be kept under control. Many of these will derive a great deal of benefit from a stay in high altitudes. Persons suffering from dysphagia should be sent to some place where there is a laryngologist who knows how to handle such cases. It is not at all to the credit of some sanatoria that they neglect the treatment of the larynx almost entirely, and it is not a rare exception for a patient to complain of pain in his throat and be told that he has a cold. It is true that we cannot cure all these cases, but it is only a short time since, while I was preparing this article, that a patient came back from a well-equipped sanatorium in the mountains because no attention had been paid to his throat. He had ulcerations on the epiglottis and on one vocal cord, besides infiltrations of the other cord, and interarytenoid spaces. By local applications these ulcerations soon healed, fortunately, and the patient could take his food without the slightest difficulty. Then I sent him back to the mountains. The infiltrations are there yet and he is hoarse, but that does not bother him. He has better chances for cure now than before.

Cases of tuberculosis of the upper air tract in many instances not only requires high altitudes, but often also a mild climate. This is another fact that apparently has been forgotten of late. A wind blowing at the rate of forty or more

miles an hour is not good for many of our patients with involvement of the upper air passages. They have been compelled to return from some well-known sanatoria in the Catskills and Adirondacks and have done better in some of our southwestern states. It is remarkable how much cold and how much wind some patients can stand, but there is quite a proportion who cannot stand this, and they do better elsewhere.

Robert Levy of Denver,* who has an exceptionally large experience in this field, attributes much therapeutic effect to the climate of Denver. In his statement others apparently agree with him, as for example, George L. Richards of Fall River, Solly of Colorado Springs and William Duffield of Phoenix, Arizona. I have reported my observations on the climate of the southwest some years ago (*N. Y. Med. Journal,* March 25 and April 9, 1898) and still hold the same views, believing that some persons will do well out west who have no chance of living in our New York climate.

(*d*) *Thallassotherapy.*—This is the treatment of patients by means of sea baths and sea air. The first will not be discussed here, since enough has been written on that subject in general. I would only add that tuberculosis in my experience is no contraindication to sea bathing. The same holds good for tuberculosis of the upper air tract, with but one exception, viz., when the salt water produces an irritating cough. In such an event it should not be allowed, but I must say that these cases are rare and that many paients take sea baths with good results when they are careful not to swallow too much water. Bathing and swimming have to be regulated as any other exercise on land. Too much of it may do harm, while if moderately taken and increased slowly it may do and has done a great deal of good. After the bath, the patient should react quickly and soon feel warm. If he is blue after coming out and a comfortable feeling does not set in promptly, sea baths should be prohibited or postponed until he is stronger.

The Treatment of Inhaling Sea Air. This is one part of our therapeutics that has been neglected in the United States until almost this day. When, years ago, I sent patients with tuberculosis in winter to Coney Island and neighboring places, one

*Laryngoscope, p. 763, 1902; and Jour. Am. Med. Ass'n, p. 707, September 16, 1899.

of our best laryngologists made fun of it. Nowadays, we have already advanced so far that we have a sanatorium for sick babies there, and it is doing good work.

And why not? I ask. This section, i. e., the southwest shore of Long Island, is to some extent protected against the cold north winds of the winter. If the sun is out with a south wind, it is much warmer there than in the city, and the patient is able to obtain the great benefit of the sun, and absolutely pure sea air. Is that not doing a great deal to stimulate the organism to renewed vitality?

Another point is sea voyages. It is almost more than strange that we who are surrounded by water have not thought more of sea voyages as a means of restoring health. But it is perhaps that the nearest and most natural is overlooked. *Lucus a non lucendo.* The English have a large experience in that respect, and lately such a place has been proposed in Germany also by Nisser, v. Leyden, v. Bergman and Sobotta. I believe that such floating sanatoria would be of great benefit to our consumptives in this country, provided that vessels are built with all the conveniences and sanitary arrangements necessary for the care of such patients. A great deal of good could be done to quite a number of sufferers, provided they are selected with proper care. Such floating sanatoria could be used easily in the vicinity of New York during the summer months.

In conclusion, I would emphasize strongly the necessity of giving our tuberculous patients the benefit not only of medicinal and surgical, but also of climatic treatment. If after thorough trial a patient does not do well in one climate, he should be sent to another. But do not let us become pessimistic after having tried one specific kind of climate or treatment without success. Whatever be the method of treatment, the physician must always maintain a spirit of optimism which will be an inspiration to himself and the patient.

DISCUSSION.

Dr. James E. Logan, in opening the discussion, emphasized the fact that whether tuberculosis be general or be entirely of the upper air passages, it varies so much in different parts of the country that it is hard to give any specific outline of treatment, or any reliable statistics of the results obtained. The cardinal principles to be observed under

all conditions is that of maintenance of the general systemic condition. Results of treatment of laryngeal, aural and nasal complications depend largely on the condition of the patient. His experience in his own locality is that a large portion of the year is very acceptable, where the environment of the patients are good. Dr. Bane had referred to the local application to the larynx of formalin, lactic acid, resorcin and iodoform; Dr. Logan mentioned iodoform simply to condemn it, as it was so irritating to the trachea, producing a troublesome spasmodic cough. He sometimes used iodoform in pharyngeal ulcerations. Dr. Levy had brought out, in a very lucid manner, the surgical proceedings to be carried out in the treatment of laryngeal and pharyngeal conditions. The speaker wished to emphasize one very important point, viz., in all cases of tubercular otitis media there should be a careful examination made of the vault of the pharynx. Most patients suffering from tubercular inflammations of the upper air tract exhibit fragmentary and degenerate adenoid vegetations. The speaker has seen many such cases, and invariably removes these masses. This is especially a point of interest in all cases of aural complications.

He has seen many such cases recover from the aural disease by this operative interference. Dr. Levy mentions deep incisions into the structures involved—the experience of the speaker was not favorable to such procedure. He believed that the destructive process would be hastened if this plan of treatment be carried on in localities where tuberculous diseases were contracted. He has refrained from making these incisions, in the light of his own experience. He removes at all times all that he can of the epiglottis, whenever it is the cause of pain or prevents deglutition. Curetting of the tuberculous ulcer, followed by a 25 or 50 per cent solution of lactic acid was his favorite plan of treatment. The speaker's results have not been so flattering nor so happy that he would not prefer sending them to a beneficial climate. In the climate surrounding Kansas City it is impossible to put patients outdoors. A great benefit was to be derived from outdoor life, athletic exercises and a generous method of feeding.

Dr. W. C. Phillips said that certainly every phase of this symposium was bound to be of great interest to all because it represents the most common of all serious affections of the upper air passages, and because of the extreme difficulty pre-

sented to the surgeon in every case. Regarding tubercular manifestations of the ear, he had no doubt that a considerable percentage of chronic purulent affections were tubercular; that it was difficult to make a diagnosis positively of tuberculosis of the ear, as microscopic examinations of the discharges did not reveal the tubercle bacillus. Never could it be positively made except by pure culture. The same holds good as to the extension of the tubercular process in the accessory spaces connected with the tympanic cavity. There was no reason why the process should not extend, and the nature and character of the surface which was involved would encourage an extension to the cells of the mastoid process and the epitympanic space and on through to the brain. There were many cases, no doubt, of tubercular meningitis that have come through the ear. As to treatment in ear cases, the most radical surgical measures should be adopted, the results being invariably good, unless in far advanced general tuberculosis. The chief dangers were the impossibility of removing the last vestige of the process. In advanced general tuberculosis, soon to be fatal, it is wiser to leave the ears alone. As to the treatment of tubercular ulcers involving the larynx and pharynx, the results in the New York climate were so bad that surgical treatment was attempted with but little hope of success. He has never seen a case involving the vocal cords, the epiglottis, the false cords and the arytenoids recover. They are always, in the speaker's opinion, fatal. In one marked case of tuberculosis involving the base of the tongue without involvement of the epiglottis or larynx, but with the lungs involved, thorough curetting was employed on several occasions, together with all the usual medicinal applications, yet the case went steadily on to fatal termination. Extreme care should be used in advising a patient to go away from home with a false hope of trying to recover from a fatal tuberculosis.

Dr. H. Bert Ellis stated that he was much impressed with the enthusiasm of the different writers. He thought that if the diagnosis is made early, the local, surgical or climatic treatment would give favorable results. If serious involvement of the larynx or pharynx is present, little hope should be held out. He had the same experience with incision as did Dr. Logan; it made the patient worse. When the speaker now sees a case of serious tuberculosis of the larynx with considerable infiltration, he feels tolerably certain the patient will

die within six month to a year. He depends entirely on fresh air out of doors, stuffs the patient with eggs and milk, and gives up all local treatment. He has two patients at the present time where there was almost total destruction of the vocal cords, and the false cords were much infiltrated, the epiglottis three times its normal size, and the patients were scarcely able to breathe; these two patients were sent to the desert, and after being there a year, the ulcers had healed. The patients are practically well as long as they remain in the desert. Operative interference on the pharynx and larynx, in the speaker's experience, usually makes the conditions worse; however, to relieve the pain, portions of the new growth can be removed with advantage.

Dr. H. W. Loeb said that operative treatment in these conditions now appealed to him from a different standpoint from what it had years ago. He then did some considerable operating with some improvement and eventual death, with slightly increased length of life and slight decrease in the severity of the symptoms. He then took the position that operative intervention was without avail. One patient was treated without operation and he lived seven years and finally died of tuberculosis of the lungs. Two years ago, when he visited Denver, he changed his mind in regard to the results of operation, because he saw laryngeal tuberculosis in which operations had been performed and good results had been obtained. They were sufficient to convince him that a tubercular patient had a better chance by being sent to a proper climate and to a competent laryngologist. He thought we should be more optimistic and any improvement should be accepted with satisfaction. He had found orthoform quite irritating; he now uses anesthesin.

Dr. E. M. Holmes reported a case ten years ago of a man who had traveled all over the west and then returned to the east. He had extensive laryngeal ulceration and looked as though he would be unable to live very much longer. His physician had him on the roof of a piazza, and he obtained some relief from lactic acid. That man is now alive and carrying on business actively in Brockton, Mass.

Dr. W. S. Bryant said that otitis of tubercular origin in his experience and that of others gave good results after surgical intervention, so much so that it seemed much earlier indicated in tuberculosis. Healing seemed to be quite

as ready as in those conditions which have no tubercular symptoms. The question of diagnosis he thought a rather delicate one, because of the inability to obtain the bacilli by microscopic test, but the clinical course of these cases, with destruction of tissue and low grade inflammation, was diagnostic.

Dr. Kaspar Pischel drew the attention of the members of the society to a paper soon to appear in the *California State Medical Journal* by Dr. Max Rothschild as to intravenous injections of Koch's tuberculin. The paper was to have been read at the recent meeting of the State Medical Society which was interrupted by fire. It is a preliminary report of about twenty-five cases with some marvelous results. Dr. Pischel mentioned one case of tuberculosis of the larynx in which the ulcers healed so quickly under the intravenous injections and local treatment with lactic acid that it could hardly be attributed to the local treatment alone.

Dr. Robert Levy, Denver, in closing the discussion, said there were some important points to consider. During the past few years he had arrived at a uniform basis as regards surgical treatment in these cases. He does not believe in advocating enthusiastically all surgical measures, but he believes there is a rational middle ground for this treatment. It was unquestionably true, he knew, that there were many cases of spontaneous cures of laryngeal tuberculosis; the literature was full of them, and they were heard of at every meeting. That the general or climatic, or any one treatment was responsible for this, one cannot affirm. It was a question of adoption of methods of treatment in the hope that because it was known that spontaneous cures occurred, that treatment would assist in this cure. The relief of the symptoms alone is sufficient to warrant treatment, for life may be prolonged by adding to the patient's comfort. He thought also that as to climate it was altogether a question of altitude. He believed, as Weber had pointed out, it was a question of fresh and pure air. As to the ear, he has observed local conditions improve while the general condition has remained the same or grown worse, and, per contra, suppurative processes have often begun in the ear when the patients were comparatively well. As to the diagnosis of tuberculous ears by bacterial examination, it was pointed out by Wingrave that the difficulty in discovering the bacillus was often due to the difficulty of procuring the specimen from the proper place.

PAPER:

A CASE OF EPILEPTIFORM HYSTERIA, PROBABLE RESULT OF NECROSING ETHMOIDITIS.

W. W. Bulette, M. D.

I bring this paper to the attention of the fellows of this Society, because I have found it intensely interesting, and further, because I believe that we assist each other in our noble profession by reporting these obscure cases, as they come under our care. It is unnecessary to enter into the etiology, pathology or treatment of epilepsy or hysteria, because these subjects have been thoroughly discussed by our neurological brethren, and I do not wish to encroach upon their field, or attempt to discuss subjects about which I know but little; in passing, however, I do wish to pay homage to the learning of neurologists, and I admire them for the beautiful and wonderful diagnoses which they make.

The case is that of Miss A, aged 18, who first consulted me October 10, 1903, complaining of sick headaches, from which she had suffered for several years, but recently the headaches had become much worse, and were now often accompanied with nausea and vomiting, particularly after much use of the eyes for near work. I found vision O. D. 5/10; O. S. 5/7.5, with 3 deg. of esophoria, media clear, both eyes; low, myopic astigmatism. I refracted the eyes without a mydriatic, and prescribed for right eye—1.50. S.—0.50 C. ax. 180, and for left eye—1.00 S.—0.50 C. ax. 180.

I did not see the case again until April 5, 1905, at which time I was asked by her family physician to see her at the hospital, where she had been confined for several months; the physician said: "This girl has been having epileptic fits for the past two years. I removed her ovaries a year ago, and have prescribed all the drugs that I know of; have had an eminent neurologist several times in consultation, and we

can do nothing for her; she is having as many as twenty fits a day; see if there is anything the matter with her nose or throat."

Upon examination of the nose and throat, I found in the left naris, a large fibrous and bony mass, springing from the crest of the sphenoid and adherent to the middle turbinate, also the same in the right; the right nostril was well filled with a dry, stinking scab, which I removed, and observed pus oozing from the ethmoid region; the faucial tonsils were hypertrophied, and nearly touching each other, and by a digital examination, I found the pharyngeal vault filled with adenoids.

The following day, at 4 P. M., I removed the obstructing masses from the nares, the tonsils and the adenoids, under chloroform anesthesia. I was advised by one of the attending nurses, that the day before I operated, the patient had ten epileptiform seizures; she took the anesthetic nicely and came out of it, without any unpleasant effects; on the sixth day after above operations, I had the patient brought to my private office, and opened the anterior ethmoid cells under cocain. She was much prostrated from shock, for the next ten days, and was obliged to remain abed, but she had no more epileptiform seizures after the ethmoid was opened, and has had none since.

I reiterate, that this girl was having as many as ten convulsions a day, before she came under my care, had her ovaries removed, at the instance of the attending family physician and the consulting neurologist, and had drug treatment *ad nauseam,* but without apparent benefit.

I submit the following history, gathered from the patient and relatives, for what it may be worth: Had measles, whooping cough and diphtheria early in life; malarial fever four years, 1893 to 1897, inclusive; also, facial erysipelas in 1893; no other disease of importance; has suffered from "nasal catarrh" for the past ten years; in winter of 1900, had severe attack of la grippe and was laid up several weeks: following this, the right nostril began to discharge a thick, yellow secretion, dull pain over the bridge of nose and forehead, and occasionally in right cheek bone: subject to "colds in the head," pain is always worse, and discharge more profuse, during these attacks.

In July of 1903, was thrown from a horse, falling on the face and right side of the body; was not unconscious from the fall, and, aside from a few scratches and bruises, was apparently not severely hurt; two weeks after this, while washing dishes, fell to the floor in a faint, and remained unconscious for four days; after getting up, was weak, and had vomiting spells, with dizziness, followed in a few days, by a convulsion, or what the doctor, in the village where she then lived, called an "epileptic fit"; these convulsions became more frequent, when she consulted the physician in September, 1903, who referred the case to me subsequently. The girl was under my care until January, 1906, in all about ten months.

A few weeks after I opened the anterior ethmoid cells, she complained of the teeth of the right upper jaw being sore, and after careful percussion of them, and using transillumination, I decided that the right maxillary antrum was filled with pus; I opened the maxillary sinus through the inferior meatus, and washed it out for some three or four weeks, when the pus discharge ceased; I removed the posterior three-fourths of the middle turbinate, and thoroughly curetted the whole ethmoid region, as it proved to be a mass of necrosis, opening into the eye socket.

I am convinced that the maxillary antrum was not primarily involved, but that the pus passed from the ethmoid into the maxillary below, because the pus promptly stopped flowing from the maxillary sinus after I had curretted the ethmoid region.

There was no history of syphilis, inherited or acquired; neither was there any family history of epilepsy, or other organic nervous affection.

I do not say that this girl is cured of her peculiar nervous affection; because the best authorities tell us, that subjects of epilepsy may be free from seizures for long periods of time, and suddenly relapse, on the least exciting cause; but, from the fact that she was having so many fits daily, before I operated, and that the seizures stopped so promptly, after the ethmoid cells were opened and given drainage, and the intranasal pressure, in a measure, relieved, would lead one to suppose that the suppurative, necrosing ethmoiditis may have been the primary and exciting cause of the epileptiform convulsions.

I saw the girl in one convulsion, and from the character of the seizure, would class it as of the hysteroid variety; it occurred just after I had finished washing out her nose the second day after the first operation, and while talking to me, I noticed her beginning to pick at the bed clothes, next trying to kick them off, complained of palpitation and choking, tried to bite me, and said "it's coming," and in a few seconds there was complete rigidity of the body, opisthotonos, several loud screams, the head turned completely under the shoulders; the fit lasted about five minues; she came out of it crying, and completely prostrated; there was no micturition, or biting of the tongue or lips; I was informed that she was never known to bite the tongue. One remarkable fact is that, although a considerable area of the inner wall of the eye socket was necrosed, and that the second day after my curettment, pus formed at the inner canthus, and in the lower lid, there was no changes in the fundus, or diminution of vision.

The girl gained about twenty-two pounds in weight while under my care, and is altogether a different person than when I first saw her. She was recently married, but minus her ovaries; I saw her last, May 1, 1906, and she had no return of her former fits.

CONCLUSIONS.

1. That this was a case of epileptiform hysteria, in all probability caused by reflex irritation from the necrosing ethmoiditis.
2. The case teaches how important it is to examine the nose and throat in every case of obscure nervous affection, and be able to recognize a pathological condition when seen.
3. That the "so-called" abdominal surgeon should not sacrifice a woman's healthy ovaries "as a last resort."

MEETING OF THE EASTERN SECTION, FEBRUARY 10, 1906.

PAPER:

CLINICAL VALUE OF THE DIFFERENTIAL BLOOD COUNT IN A CASE OF ACUTE BRAIN DISEASE AND IN A CASE OF ACUTE DOUBLE MASTOIDITIS.

W. P. Brandegee, M. D.,

In presenting for your consideration the report of these two cases, one of temporo-sphenoidal abscess, and the other of acute double mastoiditis, I realize fully that they are of but little value as conclusive proof. I offer them rather as illustrative and typical cases where all those classical symptoms are present which call for operative interference, and as instructive cases, especially in the light of the different findings of the examination of the blood, and in particular the varied polynuclear percentages which we are now taught to believe indicate the presence of pus and the severity of pus infection. It is not within the province of this paper, although the temptation is great, to discuss the various methods of blood examination, the composition, formation or changes of blood cells or the deductions therefrom, in so far as they may influence the general economy, but to call attention specifically to the clinical value of the differential blood count in these suppurative cases.

Max Einhorn, in a thesis written in Berlin, in March, 1884, calls attention to the fact that in puerperal sepsis he found that the normal percentage of lymphocytes was diminished and that the polynuclear percentage was higher than normal; but in his article, he gave no reason for the two conditions coexisting, nor did he draw any conclusion therefrom—a fact was simply stated.

F. E. Sondern, however, in several interesting papers, not-

ably one read before the Surgical Section of the Academy of Medicine in New York, on February 3, 1905, is the first one to make clear to the surgeon the meaning of the differential blood count and to present firm, clear-cut opinions as the result of long and careful investigation. Sondern makes three strong statements:

First.—"A relative percentage of polynuclear cells, below 70, with an inflammatory leucocytosis of any degree, excludes gangrene or pus at the time the blood examination is made, and usually indicates good body resistance toward infection.

Second.—An increased relative percentage of polynuclear cells, with little or no inflammatory leucocytosis is still an absolute indication of the inflammatory process, and the polynuclear percentage is a direct guide to the severity of the infection.

Third.—An increased relative percentage of polynuclear cells with a decided inflammatory leucotytosis is an accurate guide to the status of the inflammatory lesion."

These are clear, strong conclusions certainly, and, coming from an observer of standing who supports his arguments with a tabulated list of over 1700 cases, demand the attention and consideration of those interested in aural surgery.

Sondern further tells us that in the healthy adult of the middle or upper classes a normal leucocytosis in 1 cmm. of blood in 1 to 100 dilution averages about 6700; while a normal polynuclear neutrophile percentage averages about 62 per cent.

There are other observers, notably the Germans, who differ as to these normal averages, some, indeed, claiming a hypoleucocytosis of 25,000 to 30,000 necessary in order to indicate pus.

Ewing, in his work on the Clinical Pathology of the Blood, states that Ehrlich's figures may serve as a standard for healthy adults, viz., lymphocytes 22 to 25 per cent and a polynuclear neutrophile count of about 70 to 72 per cent to the 1 cmm. of blood.

Again, Limbeck, in an article published in 1889, asserts that an 80 per cent polynuclear count is well within normal limits, while T. W. Hastings in his brochure on Blood Terminology considers the polynuclear count of from 60 to 75 per cent and a leucocytosis of 7500 standard.

Despite these variations made by different observers in the normal blood count, it may be fairly established that for clinical purposes a leucocytosis of from 6000 to 10,000 and polynuclear count of from 58 to 70 per cent may be taken as a basis for comparison.

In a paper read by C. L. Gibson before the Surgical Society of New York a few weeks ago, the author distinctly asserts his belief in the clinical value of the differential blood examinations in pus infection, although in some few cases it had failed him establishing a diagnosis. He proposed a chart which should picture the relative infection of a given case by means of slanting lines drawn from the highest point of leucocytosis to the high point of polynuclear percentage, the difference in the pitch of these slanting lines denoting the severity of infection. For us, however, who have to deal with infective cases, the clinical value of a differential blood count rests on two proven facts: First, that a relatively high leucocytosis means a relative body resistance and that a relatively high polynuclear percentage means a relatively severe pus infection.

Admitting then these two conclusions, immediately we are brought face to face with the fact that in some instances the laboratory findings do not agree with the clinical picture of our acute aural suppurative cases.

The question then arises as to whether we are to disregard these differential blood counts and depend entirely upon clinical observation and experience, or despite a servere inflammatory condition, depend solely upon our laboratory reports. I would bring to your notice:

Case I.—On July 1, 1905, I was called upon to take charge of J. R., a Cuban, 16 years of age, who had undergone on June 22, 1905, a radical operation, with primary skin grafting for chronic suppurative condition of the left ear, which had existed on and off for over eleven years. The wound at this time was doing well in every way, there being only a slight muco-purulent discharge, while the skin grafts had apparently effected union with the exposed open area. At the time of his operation, there had been exposure of lateral sinus or dura.

From the day I first saw this case, the middle ear cavity was dressed daily through the external cavity and the posterior line, which had broken down four days after opera-

tion, was also dressed with iodoform gauze and a fairly large mastoid dressing was applied.

The condition of the wound improved daily until July 15th, when the patient was discharged from the hospital, to report to the office for further local treatment. During the period of July 4th to 15th, it had been noticed that his pulse had been rather slow, ranging from 60 to 70; that he had had several attacks of nausea and vomiting, which were never at any time serious, and were thought to be due to slight bilious attacks or indigestion, and that the patient was irritable, in sharp contrast to what he had been before the operation. The patient's appetite was not good and he complained of feeling weak, while the temperature varied from normal to 99 and 99½ degrees. The patient had been up and dressed and had taken several walks and drives during his last week at the hospital. For the next three or four days after leaving the infirmary, he complained of some frontal headache, continued general weakness and lack of appetite. It was also observed at this time that irritability was increasing. On July 20th, Thursday, he became nauseated, the headache became persistent and he was obliged to remain on his couch most of the day. His temperature during this interval was normal, but his pulse ranged from 60 to 68.

On July 21st, Friday, there was persistent vomiting which could not be controlled. He was drowsy all the time, his speech was not connected and articulation was not perfect.

On Saturday, July 22d, the temperature suddenly went to 102.2°, pulse rate was still slow, about 64, the vomiting was continuous and the mental condition was worse.

On Sunday, July 23d, all his symptoms were exaggerated and the temperature rose to 104.2°; sensory aphasia now developed, and all reflexes were diminished. A consultation was held, immediate operation was advised and the patient was returned to the hospital in an almost comatose condition.

Under chloroform anesthesia, an incision was made in the line of the old scar behind the ear, and both flaps retracted. The cavity of the old mastoid wound was cleared of all granulations, and of what appeared to be skin grafts, then thoroughly cleansed and explored. Necrotic bone was found over the tegmen tympani, and through this the probe led to dura. The mastoid tip was discolored and remained intact.

An incision was now made through the posterior flap at right angles to it and backward for about two inches. The mastoid tip was first ablated and the lateral sinus, which had been exposed by this procedure, was found to be discolored and collapsed. The sinus was removed from the bulb to near the torcular end, before normal blood flow was established, and was then packed off by iodoform gauze.

Attention was now directed to the exposure of the tempero-sphenoidal lobe. An opening about the size of a 50-cent piece was made through the bone at the usual site for such exploration, and disclosed a slightly congested dura. Three silk sutures were introduced through the dura and a horizontal incision of about an inch and a quarter was made over them, dividing the dura. There was but slight intracranial pressure. A long thin-bladed knife was then introduced into the brain substance in a direction forward, inward and upward, but no pus followed the knife. A second puncture forward, inward and downward was immediately followed by the discharge of a quantity of thin yellow odorless pus. A Whiting encephaloscope was carefully introduced and a large abscess cavity, having no lining wall and filled with pus and necrotic brain tissue, was found.

After this cavity had been wiped clean, a cigarette drain composed of gauze saturated with equal parts of powdered boric acid and iodoform, was inserted. The silk sutures in the dura were removed and the usual dressings were applied. About one ounce of pus escaped from this abscess cavity, and the laboratory report showed the infection to be due to staphylococcus albus.

On the third day following operation, the aphasia and the nausea had disappeared, the patient was able to retain some nourishment, the pulse was stronger and the temperature had come down to 99. From this time on, the boy gained daily, the pulse rate increased to 88, while the headaches had entirely disappeared and appetite had returned.

The entire wound was dressed daily, especial care being taken in the manipulation of the brain cavity from which all packing was removed on August 17th—the 25th day after operation.

The boy was discharged from the hospital on September 5th, practically cured. Six differential blood counts from this patient were made between July 5th and August 16th,

and they show positively the onset, the crisis and the decline of this secondary infective process.

They are as follows:

July 5—Red cells,	5,000,000
Leucocytes,	12,600
Polynuclear cells,	66%
July 10—Red cells,	4,840,000
Leucocytes,	10,600
Polynuclear cells,	61.26%
July 22—Red cells,	4,656,000
Leucocytes,	15,100
Polynuclear cells,	76.75%
July 23—Red cells,	4,500,000
Leucocytes,	15,000
Polynuclear,	83%
July 30—Red cells,	3,056,000
Leucocytes,	6,010
Polynuclear cells,	61.8%
August 16—Red cells,	3,230,000
Leucocytes,	6,000
Polynuclear cells,	52.8%

It will be noticed that in the blood counts taken on July 5th and 10th, the leucocytosis was rather high, and this was due undoubtedly to the effort at healing, but on both these the polynuclear percentage was normal.

In the blood counts of July 22d and 23d, we find a relatively high leucocytosis and rapidly increasing septic invasion, as shown by the polynuclear percentages for those dates.

Again, the blood examination of July 30th and August 16th, show a return to normal conditions. In this case, all the clinical symptoms pointed certainly to a brain infection.

The polynuclear examinations gave us a relatively higher percentage as time passed, confirming our diagnosis of a new pus formation and the increasing severity of the infection, and warned us clearly of the time for operative interference, while our leucocyte count kept us informed as to the bodily resistance of the patient. Valuable information, indeed, and clinical medicine and laboratory were in thorough accord in this case.

In contrast to this picture, allow me to report:

Case No. 2—On the evening of December 23, 1905, I saw, in consultation, M. H., a boy 12 years of age. He had been suffering from a cold for a week, and for the last two nights had complained of such severe pain in both ears that sleep had been impossible.

The boy was extremely nervous and was suffering intensely. The temperature, by mouth, was 103°, the pulse was 122 and of fair volume.

On aural examination of the right ear, the posterior superior canal wall was found to be bulging, highly injected, and prolapsed so that the drum membrane could not be made out, and there was no discharge present in the external auditory canal. The slightest pressure over the right mastoid antrum caused intense pain, and there was likewise some tip tenderness. Movement of the cartilaginous canal elicited no pain.

In the left ear, the speculum revealed practically the same conditions, although not quite so marked, while pressure over the bone developed tenderness over the left antrum and tip.

The patient was taken to the New York Eye and Ear Infirmary, and under nitrous oxid anesthesia, myringotomy was done on the right side. A specimen of the discharge which followed the incision was sent to the laboratory for examination. A bichlorid solution of a strength 1 to 5000 was ordered for aural irrigation every two hours, the patient was put to bed, a cathartic was given and fluid diet ordered. The boy slept fairly well that night, but the pain increasing in the left ear on the following day, it became necessary to incise the left drum membrane. A very purulent discharge followed this incision, and a specimen was taken for examination.

The report from the laboratory showed that streptococci were present in large numbers in both smears, and it may be stated here that the same report was returned from the laboratory on the smears, taken for the eight days following.

The patient slept fairly well after free drainage had been established, but the antrum pain was exaggerated on both sides and the temperature remained high, 102°.

On December 26th, the first differential blood count was made, and confirmed my opinion that an operation was imperative.

On the two following days—December 27th and 28th—the clinical symptoms did not improve and the polynuclear percentages increased, but having my patient under perfect control and determining to test fully the value of the blood count, I decided to postpone operation. All preparations were made, however, for an operation on December 29th, as I expected the next differential count would show still further polynuclear increase, but, to my surprise, despite the severity of the clinical symptoms, the polynuclear percentage fell from 77 to 65.9 per cent, and the operation was again postponed.

On December 31st, all the local symptoms began slowly to clear up, the general condition improved and the mastoid tenderness began gradually to disappear. The temperature, which during the week, had been fluctuating daily between normal and 102.5°, a typical septic curve, fell to almost normal, and the patient was discharged from the hospital, without operation, on January 6th, 1906. Both ears still discharged.

The following are the results of the leucocyte counts:

December 26—Red cells,		5,010,000
	Leucocytes,	19,400
	Polynuclear cells,	71.8%
December 27—Red cells,		5,000,000
	Leucocytes,	19,500
	Polynuclear cells,	75.%
December 28—Red cells,		4,980,000
	Leucocytes,	16,000
	Polynuclear cells,	77.5%
December 29—Red cells,		4,970,000
	Leucocytes,	13,000
	Polynuclear cells,	65.9%
December 31—Red cells,		4,600,000
	Leucocytes,	11,700
	Polynuclear cells,	68.8%

In examining these blood counts, it will be observed that the patient had an increasingly high polynuclear percentage and a fairly high leucocytosis for the first three days in which specimens were taken, but the polynuclear percentage was not high enough to warrant surgical interference at any time, despite the clinical symptoms.

Here, indeed, we have beyond doubt from a clinical standpoint, a typical picture of acute double mastoiditis. Note, if you please, the period of aural involvement, the bulging and highly injected drum membrane, the prolapse of posterosuperior walls, the marked pain on slight pressure over both antra and tips, the temperature, the character of the infection, the sleeplessness and the general hebitude.

The clinical picture and the laboratory were at marked variance in this case. But here the laboratory was right, and the patient made a complete recovery without any loss of function.

There are many objections to a laboratory diagnosis. I am well aware of the fact that there are those who strongly believe that, surgically speaking, they would much prefer to be sure of their ground from the viewpoint of a mastoid cavity than to leave by any chance a focus of infection which may need later on a more serious surgical operation, and it must be confessed that the position is well taken.

Again, John B. Deaver, in the *Medical News,* 1902, warns us thus:

"In the last few years there has crept into the profession the tendency to replace the bedside by the laboratory as a point from which to make a diagnosis. This we regret, for in the majority of instances, the diagnosis must be made at the bedside without the aid of the microscopist, and any man who has no confidence in diagnosis made without the aid of the laboratory, limits his usefulness."

It must be also borne in mind, that we may have to deal with acute infective cases which bear a fair analogy to the acute fulminating types of appendicitis where, to put it roughly, the blood is practically overwhelmed for the time by the inroad of the toxins and there is no blood reaction. In cases of this type, there may be no hypoleucocytosis, but we will invariably find even here a relatively high polynuclear percentage.

Again, only competent men should make a blood count in order that all sources of error may be eliminated through technical skill. One can easily see where faulty technic either in taking the specimen or in staining it, may be responsible for a wide variance in tests which may result seriously.

In searching for laboratory evidences of pus formation in or about the ear, in our acute cases, we must not forget, too,

that a relatively high polynuclear percentage may indicate pus elsewhere in the body, or that in certain diseases—scarlet fever, erysipelas and pneumonia—these same high polynuclear percentages may exist, and that the disease itself may be the principal factor in the blood changes and the aural condition only an insignificant complication. A process of elimination is often necessary if such conditions are present.

On the other hand, a sraightforward, simple scientific fact should be trusted, despite the fact that it occasionally clashes with clinical medicine. I used the word "fact" advisedly in reference to differential blood examinations, because in not one instance, so Sondern declares, where such a count has been made correctly, has there been a failure to reveal pus where pus was present. As I said at the beginning of this paper, however, these two cases are simply illustrative and instructive.

In conclusion, I would say, that in every acute infective case where we have the patient under perfect control, and where a differential blood count can be readily obtained at the hands of a competent examiner, it is our plain duty to the patient and to ourselves as well, that such an examination should be made.

Moreover, in the light of recent investigation, we must be especially careful to place more emphasis on the relative polynuclear percentages than on a hypoleucocytosis, which, while interesting from a certain standpoint, does not indicate a pus formation or measure the severity of infection.

DISCUSSION.

Dr. Stucky: I desire to add my testimony to that of the essayist as to the clinical value of the differential blood count, in the majority of cases of acute and subacute infection of the mastoid with or without meningeal infection. My rule is to have repeated counts made, and the results have much to do with my decision to operate.

PAPER:

THE NECESSITY OF A CAREFUL EXAMINATION IN THE POST-OPERATIVE TREATMENT OF MASTOIDITIS.

EDWARD BRADFORD DENCH, M. D.,

The following two cases which I shall report briefly, demonstrate, I think, the necessity of a careful physical examination of the patient before deciding upon further operative interference, in cases recently operated upon, for either an acute or chronic middle ear suppuration.

We have come to rely so completely upon temperature elevation, an increased leucocyte count and an increase in the polymorphonuclear percentage, in all surgical cases, that we are, perhaps, a little too ready to interfere in our own particular region, whenever one or more of these signs, indicative of the presence of pus, is present, in any individual case.

Given, for instance, a case of acute or chronic middle ear suppuration operated upon, with no other visible lesion, at the time of operation, it seems only right to assume that a sudden rise in temperature, and a marked increase in the number of leucocytes, and especially a large increase in the polymorphonuclear percentage, would be a sufficient indication for the operator to explore further, in the hope of relieving his patient. Such a decision would seem all the more justifiable if a pneumonia or a similar complicating lesion, could be excluded.

In the first case which I have to report, it was only by a very careful examination of the patient, that an exploratory craniotomy was avoided, while in the second case, delay simply demonstrated a visceral condition, accounting for all the untoward symptoms, and saving the patient from an exploration of the lateral sinus and probable excision of the internal jugular.

The first case was that of a boy, 10 years of age, admitted to the New York Eye and Ear Infirmary with a history of

a previous mastoid operation performed several years before. The mastoid wound had healed perfectly, and there had been no discharge from the external auditory meatus until a few days before the boy was readmitted to the hospital. Three days before he was readmitted, he fell from a street car, striking upon the right side of the head. The right ear—the one previously operated upon—soon began to discharge, and when the boy presented himself at the hospital, there was a fluctuating swelling over the site of the mastoid cicatrix. The temperature upon admission was but slightly elevated, and the boy presented no symptoms excepting slight pain in the right side of the head, and in the right ear. There was also a discharge from the right external auditory canal and a fluctuating swelling behind the right auricle, as before stated. Owing to the fact that we had to deal with a recurrent mastoiditis and an aural discharge in an ear previously operated upon, I decided to perform the radical operation. After making the usual incision, and performing a tympanic exenteration, in the usual manner, I noticed that there was a linear fracture, through the squamous plate of the temporal, passing upward and backward at the upper angle of the incision. As there was no depression of the external table of the skull, I refrained from interfering with the fracture at this time. The posterior wound was closed, but no grafts were applied to the cavity. At the time of the operation, there was some discoloration beneath the squamous plate of the temporal, but this I thought probably due to an effusion of blood, and believed it quite possible that the clot might be absorbed, owing to the fact that the operation was performed so soon after the injury, that the chances for the infection of the clot had been comparatively slight. Four days after the radical operation, the boy had a considerable rise of temperature, and he was again placed on the operating table. A portion of the squamous plate of the temporal was removed, so as to include the line of fracture, and to expose the discolored area previously mentioned. About two drachms of thick pus were evacuated from between the external table and the dura. The line of fracture was then followed up until perfectly healthy dura appeared, and until the limit of the line of fracture was reached. The major portion of the wound was closed by means of sutures, the epidural abscess cavity packed with iodoform gauze, and the patient returned to the

ward. The temperature immediately fell to normal and remained so for about a week, when it suddenly rose to 104½°. At this time, there were no mental symptoms, no cerebral symptoms of any character—motor, sensory or otherwise—and an examination of the eye grounds showed no deviation from the normal standard. The blood count showed a high degree of leucocytosis, and an increase in the polymorphonuclear percentage to over 85 per cent. I naturally feared an extension of the localized meningitis, either to the subdural space, or to the brain substance itself. A careful examination of the patient, however, revealed a large alveolar abscess, upon the evacuation of which the temperature fell to normal, and the boy made an uninterrupted recovery.

I should state here that the boy had never complained of toothache, in fact, he complained of absolutely nothing, and the alveolar abscess was found only because my house surgeon made a most careful physical examination. With less careful observation, this boy would undoubtedly have been subjected to an exploratory craniotomy.

The second case was that of a man about 40 years of age, who had suffered from a chronic purulent otitis media, affecting both ears for a long period. When I first saw him, there was very little discharge from the left ear, but a rather profuse discharge from the right ear, with some acute symptoms. The man was directed to report for further observation, but failed to do so for at least three weeks, when he returned to the hospital, with severe pain in the left ear (the one which had been quiescent when I first saw him), together with great tenderness over the left mastoid, extending down into the neck. A fluctuating swelling was present over the tip of the left mastoid process. The man was of an alcoholic habit, and his general condition was very poor. He was immediately placed upon the operating table, and a large subperiosteal abscess was opened. This abscess was due to a suppurative mastoiditis which had perforated through the mastoid tip. The ordinary mastoid operation was done, in this case, and it was found that the condition was one of epidural abscess, the sinus lying exposed in the upper and posterior portion of the wound. The external wall of the sinus was thickened and covered with granulations. As far as could be ascertained by palpation, the sinus seemed to contain fluid blood, and was, therefore, not explored. Owing to the poor general condition of the

patient, I contented myself with simply clearing out the mastoid, and made no attempt to perform the radical operation, deeming it wiser to defer this until a later period. The patient did very well for three or four days, when his temperature rose to 104½°, then fell spontaneously to 101½° or 102°, and continued these excursions, daily, for a number of days. The blood count showed a gradual and rapid increase in the number of leucocytes, with a marked increase in the polymorphonuclear percentage, the polymorphonuclear cells ranging anywhere from 80 per cent to 90 per cent. The patient was somewhat nauseated, but otherwise felt perfectly well. I was inclined to explore the lateral sinus, but did not do so on account of the fact that the patient was very much jaundiced. Knowing that an acute catarrhal jaundice may cause a sudden rise in temperature, and also a marked leucocytosis, although I believe an increase in the number of polymorphonuclear cells has not been recorded in this condition, I decided to postpone operation. This patient made an uninterrupted recovery, as soon as the visceral condition was relieved. His mastoid wound has almost entirely healed, and he is perfectly well.

These two cases are reported simply to show the necessity of investigating carefully practically every organ of the body, before submitting our operative cases to further interference, provided we are certain that at the time of the first operation a perfecly satisfactory operation has been done.

This last case, for instance, could easily have been placed upon the table, had his jugular removed, and been reported as a successful case of jugular thrombosis. The operation would probably not have been fatal, but, certainly, it would have been unnecessary.

In the first case reported, an exploratory craniotomy would probably have been done had not the alveolar abscess been discovered.

It behooves us, I think, to examine our cases most carefully before subjecting them to severe operative interference, and to remember that, given a suppurating ear, although the most probable site of a purulent infection is the region of the wound, it is still possible for our patient to suffer from some condition other than that intimately associated with the region in which we are so much interested.

PAPER:

WHAT CASES OF CHRONIC PURULENT OTITIS REQUIRE THE RADICAL OPERATION?

ARNOLD KNAPP, M. D.

The radical operation for the cure of chronic purulent otitis has been practiced for about seventeen years. It may be assumed that a possible exaggeration of this operation's true worth, due to the enthusiasm with which every apparently meritorious procedure is received during the first years, has now been corrected, and that a sober judgment of the value of the operation can be rendered and its indications defined.

As far as I can judge, the views on this operation are tending to a greater conservatism. Ballance[1] is the only one who states that he has no longer any doubt that all cases of chronic purulent discharge from the ear should be treated by the complete operation. Koerner[2] says in his book that the radical operation is indicated as soon as the diagnosis of osseous disease is confirmed. From a personal communication, however, while visiting his clinic two years ago, he had returned with favor to ossiculectomy and subsequent treatment with the tympanic canula. Grunert[3] states that the greater half of the cases where the excision of the ossicles was indicated, were healed by this operation. Scheibe in Bezold's clinic no longer insists on a radical in every case of cholesteatoma, but treats his cases with the tympanic canula and operates only if the fetor does not disappear in three weeks. Jansen[4] is inclined to think that in these apparent cures the bone disease simply becomes latent for a time. To return to the subject of this paper, I shall leave out of consideration cases of chronic purulent otitis where intracranial complications, stenosis of the canal and acute mastoiditis are present, as the wisdom of operationg under these conditions must be self-evident.

We have remaining a series of cases which are not of the same importance. Some of these are more apt to be followed by dangerous cerebral symptoms, and should be operated upon under certain qualifying conditions. We shall first of all endeavor to trace the characteristics of these cases. An excellent and practical classification has been adopted by the Berlin Ear Clinic, as described by Heine[3], where the cases are divided into two groups: dangerous and non-dangerous. In the former, the bone is affected, especially in the attic and antrum; in the latter, the inflammation is more localized to the mucous membrane of the tympanum, a region from which intracranial complications rarely ensue.

In what way can we tell that the bone is involved? First, by the characteristics of the discharge and its fetor. Second, by the otoscopic picture; there is a total defect of the drum or the perforation is marginal, the adjoining portion of the annulus eroded, the perforation being situated next to the superior or posterior wall; in other words, contiguous to the attic and antrum. The use of the probe in my opinion is of but little advantage.

It is important to determine the presence of cholesteatoma; this is sometimes difficult. In cholesteatoma, the typical pearl-like epithelial scales are present in the canal or can be fished out with the hooked probe, or by the use of the tympanic canula, and have a characteristic odor. The presence of cholesteatoma is an urgent indication for operation, unless the opening of the accessory cavities into the middle ear is large, and there apparently is no tendency to retention. I remember seeing a patient with the history of an old otorrhea, who was suffering intensely. Examination revealed an inflamed canal, a very tender mastoid, and the depth of the ear canal filled with cholesteatoma. He was sent to the hospital for operation. Before operating, I attempted to clean out his ear and removed enormous quantities of cholesteatoma from the mastoid process. This was facilitated by a large defect in the posterior wall. After it was all removed, we had a large clean cavity before us, like after a successful radical; the patient's symptoms were relieved and an operation was no longer necessary.

In cases of simply chronic osseous involvement, the "caries and necrosis" of the authors, much can be obtained by conservative treatment; if under these conditions the discharge

does not cease or lose its odor, the question of operation should be considered.

In addition to these local conditions, we have three general symptoms, often present, whose proper interpretation requires considerable experience. These are headache, nausea and vertigo. The nausea is the least characteristic and usually associated with one or both of the others. The presence or aggravation of these symptoms with a cessation of the discharge, point to a retention in the accessory cavities and usually necessitates operation.

Headache, of course, varies with the sensitiveness of the patient. The misleading symptoms of hysterical women have led to needless operations. The headache may be localized to the ear, or to that half of the head; it may be supraorbital or occipital in location. We must try to bring this symptom in relation to the ear disease. It has seemed to me that pain over the eye on the same side as the ear affection is often connected with a process in the attic, while disease further back in the antrum, especially in its posterior wall, causes more frequently occipital symptoms.

Vertigo is another symptom which must be gone into thoroughly. The ideas of the laity on what constitutes dizziness are very vague. Yet, if it be present in a typical manner, it is of greatest importance, indicative of labyrinth disturbance and a very important operative indication. In one of my patients it was the only general symptom; at operation, granulations were found extending through the oval window, which were successfully removed, and the symptom permanently relieved. In many cases vertigo means a lesion of the external semicircular canal, and with it there is always nystagmus, which can often be elicited only by examining for it. It must not be forgotten that in disease of the semicircular canal the hearing need not be lost.

This completes the "dangerous" group; the other cases where there is but little likelihood of intracranial extension, are those in which the mucous inflammation in the tympanum predominates; these are the cases with anterior or central perforation and where the Eustachian tube is usually involved. I have been observing for years a young patient of this kind where the disease seems to be entirely in the anterior and tubal part of the tympanum. There are no symptoms beyond the discharge, which is muco-purulent, and without odor.

The patient has been perfectly willing to undergo any operation, but we would accomplish absolutely nothing by converting the attic and antrum into an open cavity. It must be confessed that we are powerless in accomplishing much by operating for disease of the tympanic walls proper. Necrosis of the promontory wall had better be left alone. Curettage about the mouth of the Eustachian tube is often spoken of, but should be performed with great caution. The recesses in the tympanum are so hidden and surrounded by vital parts, not only for the patient, but for the operating surgeon, I refer to the facial nerve, that we frequently cannot remove all disease. I have a case in mind of a boy on whom I performed the radical operation three or four years ago, who, in addition to disease in the upper cavities, presented considerable caries in the posterior segment of the tympanum. Every attempt to curette this region caused a facial convulsion, and the operation could not be completed; this area is still unhealed. I do not think it can be too frankly emphasized that lesions in the tympanum without changes pointing to affections of the adjoining cavities do not call for the radical operation. The method cannot be radical in the true sense of the word, the patient is not relieved of the main symptom, the discharge, and the surgeon is discredited.

In the former, or so-called "dangerous" group, there are many cases where minor operations suffice to bring about good drainage and to prevent retention and its dangers, but where there still remain indications of bone disease. The patients are safe when under occasional or constant observation. In these we must be led by the patient's wish. The operation is not urgent but justifiable. We cannot blame a young girl from wishing to be relieved of a running ear. Other patients may wish to be relieved from the surgeon's apron strings, and to regain their natural liberty. One point which is of the greatest importance, is the state of the hearing in the other ear; if the other ear is poor, we should do everything to avoid a radical in the affected ear, as we cannot guarantee, however careful we may be, but that the hearing will be diminished after the operation.

In conclusion, allow me to express my views on the indications for the radical operation as follows:

The operation is not indicated when the tympanum, and especially its mucous lining, are principally involved, because

intracranial complications are not likely to ensue and the operation usually accomplishes nothing.

The operation is urgent when the symptoms of headache, nausea and vertigo are associated with and in relation to chronic purulent otitis; where the bone is found affected, or cholesteatoma is present, and these symptoms are not promptly relieved by a minor operation.

The operation is indicated when the signs of bone involvement continue after conservative treatment has been followed for a certain length of time, and the odor in the discharge persists. The operation is not necessarily urgent in these cases, as good drainage is present; the question of operation then depends on the patient's wishes and the condition of the hearing in the other ear.

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PAPER:

TECHNIC OF THE RADICAL TYMPANO-MASTOID OPERATION WHEN COMPLICATED BY THE ANTERIOR POSITION OF THE SIGMOID SINUS.

W. Sohier Bryant, M. D.

There is an idea more or less prevalent in the profession that the radical operation is seriously complicated when the sigmoid sinus approaches the external auditory meatus. The following cases, in my practice, show that the fear of bad results in this anatomical condition is unwarranted:

Case I.—This case was shown before the New York Otological Society, the Otological Section of the New York Academy of Medicine, the American Academy of Ophthalmology and Oto-Laryngology and the Harvard Medical Society of New York City. The patient was a pale, well-developed woman, 24 years old. The year before she had lost a sister from meningitis following a radical operation for ear conditions similar to her own. For many years she had had otorrhea and severe headaches. She had undergone prolonged treatment, which included the removal of the ossicles and tympanic curettage.

When I first saw the patient, the tympanum appeared devoid of contents and of drum membrane. From the neighborhood of the aditus there was a scanty and very fetid discharge. With a probe, a large area of rough, dead bone was found on the upper and inner wall of the tympanum and antrum. No bone could be felt directly over the tympanum. On external pressure, there was tenderness over the antrum. The temperature was 99°F., by mouth.

Operation.—The operative field was sterilized in the usual manner, and the ear douched with bi-chloride of mercury (1-3000). I commenced a radical operation under ether anesthesia, by making a curved incision down to the periosteum from the tip of the mastoid process to the upper border of the

pinna, one-fourth of an inch posterior to the fold of the ear. The chief bleeding points were secured with artery forceps. With a straight periosteum elevator, the periosteum was cut and drawn forward and backward from the line of incision, and the external surface of the mastoid process was exposed from the temporal ridge to the tip. Great care was taken to remove the periosteum in an unbroken sheet because of its value in hastening convalescence.

Beginning at the point of election, 2 mm. below and 6 mm. behind the spine of the meatus, with my front-bent gouge (Fig. 1), I then bored a hole parallel to the posterior wall of the osseous meatus. After proceeding through compact bone for 4 mm., the dura mater was uncovered. I then enlarged the circular hole with my gouge and cut a groove in the mastoid

Fig. 1.

process parallel to its anterior surface. This groove extended 15 mm. from below the temporal ridge, and thus exposed more dura mater over the knee of the sinus. With my small specially adapted periosteum elevator, I then separated the periosteum (Fig. 2), without lacerating it, from the whole posterior and upper walls of the osseous meatus. A thin, narrow sheet of copper, bent backward at its tip, was inserted into the meatus behind the periosteal flap and its hook caught in the aditus ad antrum. This hook was kept in position to protect the periosteum and epithelium of the osseous meatus so long as there was danger of wounding it. With a rongeur, the bone was then removed from the back wall of the meatus. This bone at its thinnest point over the knee of the sinus was less than ½ mm. thick; that is, about as thick as heavy wrapping paper (Fig. 3).

The dura mater was pressed back out of the way with a flat, bent retractor to facilitate the removal of the meatal wall. The outer wall of a very small antrum was then exposed. This was opened with my gouge. No pneumatic cells were encountered. The bone was eburnated except in its carious parts.

On exploring with the probe in the neighborhood of the tegmen tympani, the probe suddenly slipped upward for about 20 mm., thus demonstrating that the tegmen was dehiscent, and that there was a perforation in the dura mater. The tegmen mastoideum was found carious and was removed with a curette. The inner wall of the antrum was also carious. This wall was curetted, very carefully, with a small curette, to avoid injury to the semi-circular canals. The remaining part of the tegmen tympani was removed in the same way. The upper posterior part of the inner tympanic wall and aditus was rough, bare bone. This was curetted carefully to avoid the labyrinth and the facial nerve, and precaution was taken to stop as soon as firm bone was reached, and not to go closer than 2 mm. to the upper border of the oval window. I removed the bone from the exposed dura mater posteriorly and superiorly, until the two exposed surfaces met in the tentorium

Fig. 2.

cerebelli. The dura of the posterior fossa had been exposed over a triangular area 20 mm. long with its base outward. The dura of the middle fossa was exposed over a rectangular area 22 mm. long antero-posteriorly and 12 mm. deep. The dura appeared very thick and white over the tegmen tympani and mastoideum and normal over the sinus.

With the front-bent gouge, the posterior osseous wall of the meatus was levelled in a line from the floor of the aditus ad antrum to the outer lowest point of the tympanic plate. The outer wall of the attic and the hanging wall of the meatus were also removed with my gouge. After the tympanic end of the Eustachian tube had been thoroughly curetted as far as the isthmus, to promote its occlusion by cicatrization, and the membrano-cartilaginous meatus had been slit the whole length of its posterior wall and the cut turned upward at its outer end, the wound was irrigated with a warm, normal, salt solution. The operation was concluded after one hour and one-half of hard work. The dissection of the labyrinth capsule occupied most of the time.

A piece of ½-inch gauze, with its edges turned in, was placed on the uncovered knee of the sinus and carried out of the wound. The periosteum and skin flaps of the wound were put in position and the soft parts were allowed to sink into the excavation in the bone. The remaining cavity was then allowed to fill with blood to facilitate the formation of the

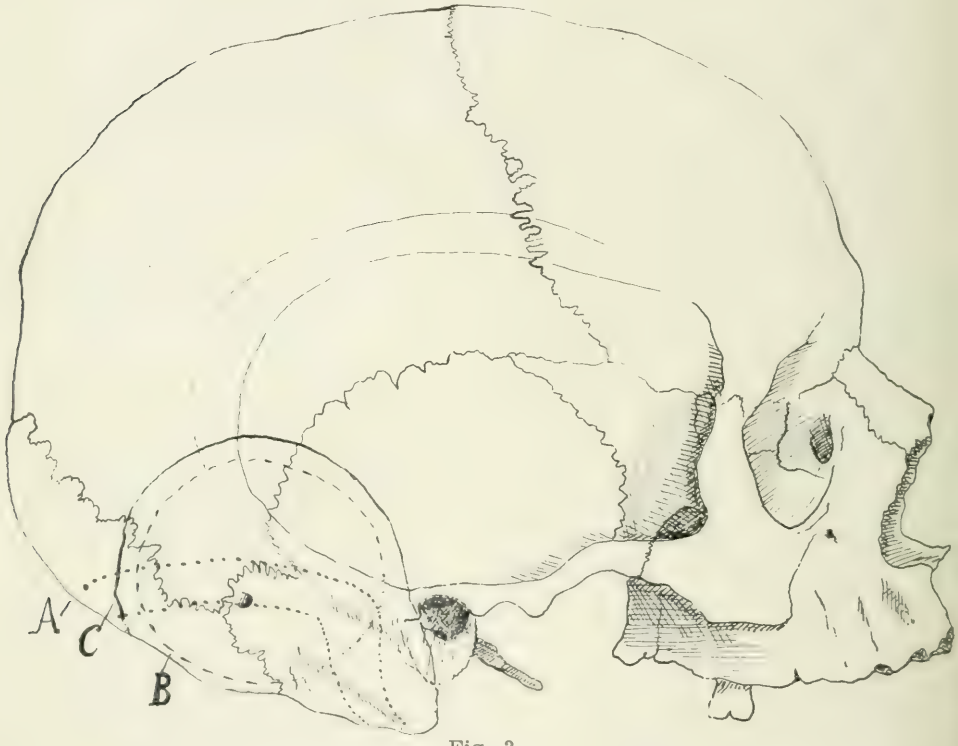

Fig. 3.
Skull showing diagrammatic outline of the lateral and sigmoid sinus in a dotted line A.

modified blood clot and to allow as much healing by first intention as possible. The meatus was lightly packed with plain gauze with a selvedge edge. Care was taken to separate the edges of the slit membranous meatus only slightly. A gauze dressing moistened with normal salt solution was put over all.

Convalescence.—The wound was dressed daily. The morn-

ing after the operation the temperature of the patient reached 100.6°. During the first night the patient had some pain in the ear, and the gauze drain was removed from the wound and the packing taken from the meatus. On the fourth day the tympanic cavity was dusted with boric acid and a strip of gauze lightly placed in the meatus. On the sixth day the posterior wound was healed and the tympanic cavity had ceased discharging and was only slightly moist. The patient sat up for the first time. The use of alcohol in the meatus was begun.

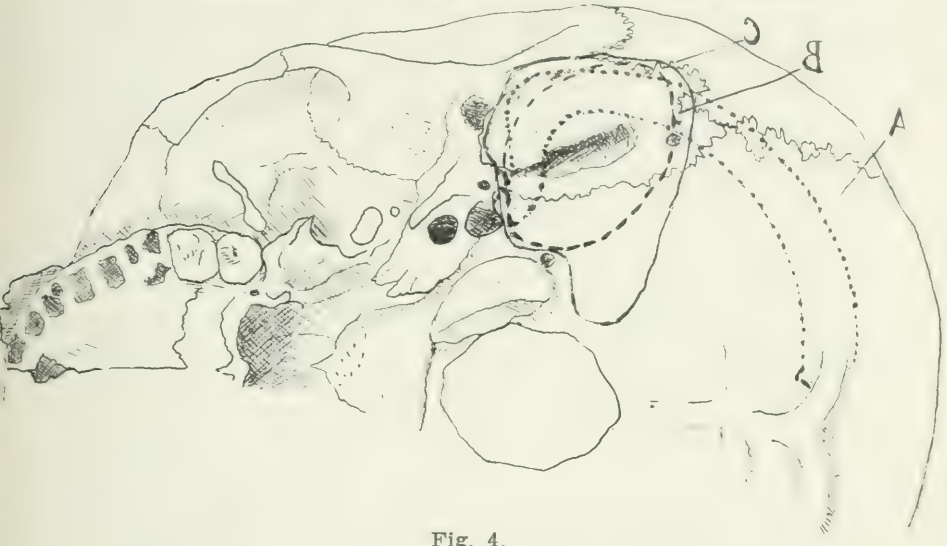

Fig. 4.

Horizontal section through the right temporal bone midway through the meati, showing diagrammatically by a dotted line: A. The course of the lateral sinus in our case. B. External auditory meatus. C. Internal auditory meatus.

This was continued until epidermization was complete. On the 11th day the patient was up and dressed. On the 13th day the wound behind the ear had finished desquamating. On the 14th day the patient went out. On the 22nd day the ear was perfectly dry and had ceased secreting. On the 23rd day the enlarged tympanum was almost completely epidermitized. The mouth of the Eustachian tube was the only granulating point. On the 27th day the patient had gained 12 pounds. On the 42nd day the tympanum was solidly epidermitizing. On the 58th day crusts and scabs had ceased forming and wound was entirely desquamated. On the 71st day the watch was heard 9 inches.

Nine and one-half months after the operation, the ear was in the same good condition. The post-aural wound was indicated by nothing more than a faint line or scar. The meatal canal was slightly larger than before the operation, while the middle ear cavity had filled in a little. On inspection, the upper posterior outer portion of the meatus appeared blue.

When the vessels on the side of the neck were compressed, a pulsation of this blue area was clearly seen. This was unquestionably the knee of the sinus showing through. Seventeen months after the operation, the same watch was heard at 10 inches, and the ear remained clean and shining, and in the same perfect condition. The knee of the sinus was visible, but was not as blue as formerly.

Case II.—This patient was a woman about 48 years old. For very many years she had suffered from a running ear and from frequent, excruciating headaches and occasional rises of

Fig. 5.

temperature. She was a doubled-up case of old Pott's disease, and for a number of years had been an invalid. She weighed 70 pounds. Before the operation, her temperature was 99°F., pulse 82, respiration 18.

Operation.—The preparation for the operation was similar to that of the previous case, except that a subcutaneous injection of atropin (1/100 grain) and morphin (¼ grain), and one of fluid extract of ergot (1 dram) were given. The operation was performed under gas and ether. I commenced with my front-bent gouge, following the same method and technic as in the preceding case. The outer table of the mastoid process was entered, and soon the sigmoid sinus was uncovered at the knee. The bone of the posterior meatal wall covering the sinus was taken out in the same manner as in the previous case. At its thinnest point, the bone measured 2 mm. in thickness. (Fig. 4.)

No cells were found. The whole bone was sclerosed. There was no antrum. This was replaced by a little cancellated bone.

Nothing more than the aditus could be found. The region of the tegmen and that posterior to it were a mass of granulation tissue. The bone covering the inner and anterior aspect of the knee of the sinus was very friable. The sinus pulsated; on rotation of the head, the pulsation ceased. The tegmen covering the mastoid antrum was dehiscent over its entire extent. The dura was very thick, but not discolored. The edges of the perforation in the bone were crumbly, and were removed, exposing the dura over an area 12 mm. by 6 mm. As in the previous case, the two openings where the dura was exposed were thrown into one. The tympanum was found fairly clean. It had a hard, smooth, bony wall. There was no sign of pus anywhere. No ossicles were found. The membranous meatus was slit as in the first case. This operation lasted 55 minutes. The wound was dressed as in the first case.

Convalescence.—On the second day after the operation, the temperature was 100.2° F., pulse 110, respiration 30. This was the maximum record during the convalescence. There was severe pain in the head, and an ice cap was applied. One-fourth grain of morphia was given twice during the day. On the second day there was severe headache, and the ice cap was again used. On the fourth day, the temperature was 98.6°, pulse 94, respiration 24. The severe headache continued. On the fifth day there was a small quantity of fetid discharge of greyish-yellowish hue. The bone was bare and sloughy in appearance. There were no granulations. The ear was cleansed with $H_2 O_2$ and boric acid powder dusted in. The posterior wound had closed by first intention. There was still much headache, and the ice cap was applied. On the sixth day the tympanic wound was much improved. The ear was syringed out with saline solution and $H_2 O_2$ instilled, followed by the insufflation of boric acid powder. The posterior wound had broken down. There were no granulations in it. On the 10th day, the posterior wound closed again. The patient was much improved, but had darting pains in the head.

On the 11th day the patient sat up. On the 12th day the temperature was 98°, pulse 80, respiration 24. On the 14th day the patient was fairly comfortable. On the 25th day there had been no discharge from the ear for some days, and the middle ear was nearly dry. The patient was very comfortable, and went home. On the 40th day, the desquamation of the scar

had finished. On the 52nd day, there was no deformity seen and only an external faint trace of the wound.

On the 62nd day, the middle ear and canal had wholly epidermitized. On the 68th day, there were occasional slight headaches, but they differed from the old headaches in character and location. No sign of the post-aural wound was visible except a line or scar. The meatal canal and tympanum were slightly larger than before the operation. The acoumeter was heard 12 inches.

These cases show the advantages of the use of my front-bent gouge. Since the position of the sinus cannot be determined previous to the operation, extreme caution must be used in removing the outer table of the mastoid. The front-bent gouge insures perfect safety in this procedure. It obviates the risk and delay caused by wounds of the lateral or sigmoid sinuses. It also supplies a very delicate and powerful instrument for the minute bone dissection required in removing the tympanic walls. It gives the maximum of insurance to the operator against accidental wounds of the facial nerve and semi-circular canals as well as of the sinuses and brain.

When the sinus has been uncovered in an extremely anterior position, the posterior wall of the auditory meatus is removed, and the dura mater covering the front of the cerebellum is pressed back with a flat retractor, to allow the operator to enter the antrum mastoideum without further trouble. The membranous meatus is slit posteriorly and longitudinally. The outer end of the cut curves sharply upwards to the upper wall. The meatus is lightly packed with gauze to slightly separate the edges of the cut surface. The post-aural wound is allowed to close without sutures and the soft parts to sink inward. The remaining small cavity fills up with a modified blood clot.

The reasons for not packing the excavation are that the granulations grow much better and do not become redundant. They are not pressed out of existence with too tight packing, nor irritated into fungus growth by the stimulation of too loose packing, but a natural, healthy, solid growth takes place, which encourages the encroachment of stratified epithelium. The happy mean or proper use of packing is difficult to achieve, moreover, it is unnecessary, as there is nothing but disadvantage in the large epidermitized cavity which results from packing.

The assistance of a collapsed wound filled with the modified

blood clot is utilized to aid in obliterating the large excavation which the operation requires. This enormous cavity, when it is kept open, needs a very long time for epidermitization, unless skin grafting is done. Lessening the volume of the chamber shortens this period proportionately. My modified blood clot method reduces the size of the enlarged tympanic cavity and consequently the area of the surface of the cavity which must either granulate up or epidermitize and thus shortens the convalescence considerably. It is desirable to reduce the size of the resulting cavity to as near that of the normal tympanum and meatus as possible, to favor the spontaneous ejection in later years of cellular detritus through the meatus. On account of the shortened convalescence, skin grafting is not necessary.

Another advantage in this method, sometimes a very important one, is, that my modified blood clot gives the maximum result in cosmetic effect by reducing the deformity resulting from the scar so that nothing more conspicuous than a linear cicatrix is left.

The second case shows that the blood clot is not dangerous if infected. The infected clot melts away and leaves only the portions which are not infected. These aid considerably in the process of repair.

After-treatment is directed to the avoidance of traumatic injury to the granulating surfaces. Boric acid has proved itself to be the best form of dressing. Toward the close of epidermitization, if any points are epidermitizing too slowly, they are assisted with alcoholic applications.

The radical operation for suppuration of the temporal bone is indicated when it becomes necessary to remove the affected area *in toto*, to permanently close the Eustachian tube, in order to cut off ingress of infection from the naso-pharynx, to establish complete drainage and to remove masses of necrotic material. The great majority of cases of suppuration of the tympanum and temporal bone can be cured without resort to this operation by the method I have described elsewhere. Everything except the removal of the affected area *in toto* can be accomplished in most cases by other means than the radical operation. When the radical operation is found necessary, it is desirable to follow the technic which will give the shortest convalescence and the minimum deformity with the best possible hearing.

My modification of the radical operation and after-treatment

has advantages in the ease and safety of the operation, in the shortness of the convalescence and the insignificant scar left in all cases, and in the comparatively good hearing which results in direct proportion to the shortness of the convalescence.

Conclusions.—I. The extreme anterior position of the sinus is no obstacle to a complete radical operation.

II. The front-bent gouge is the safest and handiest instrument in otological surgery for the bone carving necessary.

III. Avoidance of packing in the excavated middle ear cavity results in a minimum of deformity and scar. Neither does it produce objectionable granulations. It hastens convalescence and epidermization by lessening the cavity, which must granulate up and the area which must finally epidermitize.

IV. My modified blood clot hastens the convalescence considerably.

V. The possibility of having an infected wound is no contra-indication to this modified blood clot method, nor does it interfere with the cosmetic results.

VI. Exposure of the dura mater does not contra-indicate the modified blood clot.

VII. It is not necessary to suture the posterior wound in order to secure a perfect cosmetic result.

PAPER:

AN UNUSUAL GROWTH OF THE MASTOID PROCESS, FIBRO-CHONDRO-OSTEOMA OF THE MASTOID ANTRUM.*

S. MacCuen Smith, M. D.

The following case is of interest, in the first place from the fact that a growth was found in the mastoid antrum during an operation for chronic otorrhea, but more especially on account of it being attached to the necrotic surface by one short slender pedicle, and yet the pathologic examination showed it to be composed of fibrous, cartilaginous and osseous structure. When first observed it resembled a fibrous polypoid growth, was movable in all directions within the radius of its pedicular attachment, and did not bleed when detached from its thread-like pedicle.

The history of the patient is as follows: Master M. L., 16 years of age, was born of healthy parents, and never suffered from any diseases peculiar to childhood except measles when four years of age, and his parents are not aware of his having had any ear complication from this illness. His only other illness was a severe attack of typhoid fever two years ago, from which, so far as is known, he made a good recovery without any suggestion of aural involvement. The patient, as well as his parents, deny positively that he ever had any trouble with his ears until about the middle of November, 1905, when it was noticed that the hearing of the left ear was rapidly becoming impaired. His physician was consulted and on examination found some foreign matter in the ear which he diagnosed as "wax," which forceful syringing, however, did not remove. Forceps were then resorted to and the traction produced marked vertigo and some bleeding, at the sight of which the physician became alarmed and sent him to the Jefferson Hospital the following day, where he came under the care of the writer. An examination showed a large fibrous

polypoid growth filling the entire canal, the pedicle apparently having its origin in the tympanic cavity.

He was admitted to the Jefferson Medical College Hospital on December 6th, 1905, and operated on on the following day. After removing the growth, we found an extensive hyperostosis of the posterior wall of the external auditory canal, which so far obstructed the lumen of the canal that the tympanic membrane could not be seen. As a very foul odor came from the brownish-yellow discharge that escaped following the removal of the polypus, we concluded to perform a radical mastoid operation as a means of correcting the hyperostosis and the evident necrosis of the tympanic cavity and mastoid antrum.

The entire mastoid process was of the eburnated variety until the antrum was reached, which forced the conclusion that the case was, after all, of the usual chronic nature, notwithstanding the protestations on the part of the patient and his family to the contrary. The antrum and tympanic cavity were extensively involved in the necrotic process, while the malleus and incus had become disintegrated, probably some months or years ago, and made their escape in the discharge.

The tumor was located in the inferior and anterior part of the antrum, and filled in the concavity caused by the more or less drooping of the canal adjacent to the hyperostosis.

Growth, natural size.

The following is the report received from the Jefferson Hospital pathologist, who made the examination of the tumor: "The specimen is an ovoidal mass 1 cm. long, 0.6 cm. wide and 0.3 cm. thick; weight 0.2 gm. The surface is smooth, glossy, slightly nodular and greyish-pink in color. The tissue is hard at some points and soft and elastic at others.

The specimen was fixed in Zenker's solution, decalcified in 10 per cent nitric acid, then dehydrated, infiltrated with paraffin, sectioned and stained with polychrome blue, hematoxylin and Van Giesen, also eosin.

Histology:—The sections are almost completely marginated by stratified squamous epithelium. At some points in this structure the four layers of the epidermis—the strata cornea, lucida, granulosa and Malpighii—can be distinguished, while at others but a few rows of the strata cornea and Malpighii are present. Typic prickle cells are not demonstrable. The stratum papillare of the corium presents numerous elevations and depressions where the epidermis is thick and shows all its layers, but is absent where but a few rows of the corneal and Malpighian strata are in evidence. That part of the margin not covered by skin is formed by a band of fibrous tissue and this is probably the point of attachment of the specimen to the contiguous tissues. Beneath the skin are areas composed of loosely-woven strands of fibrous tissue transmitting numerous small bloodvessels; at points the perivascular structures are densely infiltrated with mononuclear leukocytes. The sections also contain trabeculae of fibro-cartilage and here and there harder and denser areas, osteoid in character, which necessitated decalcification in order to section the specimen. At the sides of this cartilaginous tissue are numerous multinuclear cells varying from 40 mikra to 70 mikra in length and from 10u to 25u in breadth. These cellular elements are indistinguishable from chondroblasts and near them the cartilage is eroded and degenerated; this destroyed tissue is being replaced by a loosely-woven, fibrillated and cellular fibrosa. In the structures between the cartilaginous trabeculae are numerous large lymph sinuses, some of them empty, while others contain a granular acidophilic material.

Diagnosis:—Fibro-chondro-osteoma of the mastoid antrum.

Discussion of Papers of Drs. Dench, Knapp, Bryant and Smith.

Dr. H. L. Myers said that while listening to Dr. Knapp's excellent paper he had not noticed that he spoke of the status of paralysis of the facial nerve, coming on during the acute or chronic stage, as an indication for the simple or radical operation. He would be glad to have an expression of Dr. Knapp's views on this subject, as he finds very little satisfactory literature concerning it. Although it is not within the scope of his present paper, he hoped he would tell

something of the proper procedure to adopt in cases where facial paralysis occurs during acute otitis media purulenta.

He was particularly interested in this, as he had just been called to treat a case of this kind and was somewhat at a loss to determine the best course to pursue.

About two months ago the patient suffered an attack of acute purulent otitis media; he was attended by a quack who did not do paracentesis, and the membrane did not rupture spontaneously for some days. Facial paralysis came on the day before the membrane ruptured. The patient gave no history of pain or tenderness over the mastoid, and the pain in the ear subsided promptly, after spontaneous perforation of the membrane, and did not recur, but the paralysis remained. A few nights ago he was summoned by the patient's physician to "operate for mastoiditis," and was further informed that the patient's face was drawn and that he had had a convulsion.

He had responded promptly and was surprised to find the man's physical and mental condition good; pupils and fundi normal, no dizziness, nausea nor headache; pulse and temperature about normal, no tenderness over mastoid, external meatus filled with pus, which was coming from a small perforation in the upper posterior quadrant of the membrane. Nearly complete facial paralysis, on side involved. Close inquiry elicited a history of syncope, due probably to his having eaten one dozen fried oysters for breakfast. There is also an undoubted hysterical element in his case.

The facial parlysis is seriously interfering with the man's ability to earn a living. He would be glad if Dr. Knapp would discuss this phase of the question along with those of the chronic cases.

As he could get no history of mastoid involvement at any stage, there was a question in his mind as to the indication for opening the mastoid, and he thought it best to establish good drainage, administer alteratives for a time, and await results.

Dr. F. B. Sprague said that he had always felt that the tendency to radical operations was altogether too strong and many were unnecessarily performed, especially in children. He thought many of these cases, where the disease had existed but one or two years, and some even longer, could be cured by persistent irrigation of the tympanic attic, together with

the removal of granulations and polypi and application of proper chemicals to destroy the diseased tissue. If this does not do, his first operative procedure was, unless there was extensive necrosis, to remove the ossicles and carefully curette the attic and aditus, and, in some cases, remove the outer wall of the tympanum through the canal. In his practice, a little more than thirteen years, these had always been the first steps toward the cure of this disease, and many cases had been cured. If these means do not avail after several months of treatment, the radical operation is done.

One very important step in the cure of the disease in children, is the careful and complete removal of all adenoid tissue in the nasopharynx, especially that behind the Eustachian cartilage in the fossa of Rosenmüller, and also hypertrophied tonsils, with special attention to the supratonsillar fossa. If these two so often neglected areas are given due attention, many chronic suppurating ears will get well.

Dr. McCaw said he had listened with great interest to these papers on mastoid conditions, and especially to Dr. Knapp's. He fully agreed with him that more care should be exercised in the selection of the cases of chronic purulent otitis media, which were subjected to the radical operation. Unless the accessory cavities are involved, or the bony walls undergoing necrosis, or drainage interfered with, much can be done by conservative treatment. He believed fully in the radical operation for the cases above enumerated, but for those cases which are giving no trouble except for the discharge, and in which drainage is free, and those in which only the mucous membrane of the tympanum, especially about the mouth of the Eustachian tube, is involved, with recurrent discharge with each successive head cold, the conservative plan of treatment is to be preferred. When the ossicles are necrosed and the annulus tympanicus involved, an ossiculectomy with a thorough curettage of the diseased annulus will in many cases give satisfactory results. In the few cases in which he had done the radical operation, the hearing has been worse afterwards. Instead of drifting too far into the field of radicalism, or too far the other way into the field of conservatism, a middle road should be taken, and care in the selection of cases for either line of treatment should be used.

Dr. Chevalier Jackson said: Dr. Knapp mentions hysterical simulation of serious ear symptoms. The speaker re-

membered two such cases where the hysterical element was discovered only after radical operation by the development of other neuropathic symptoms. In both these cases, the simulation of aural vertigo and vomiting proved a blessing in disguise, as it induced him to urge immediate radical operation and now they are cured of their chronic suppuration, which might not have been the case otherwise.

After over 200 ossiculectomies which yielded only about 35 per cent cures, he had abandoned the operation, for the reason that he did not consider it a minor operation. In one case where he had diagnosticated ossicular necrosis without disease of the bony tympanic walls, he removed the malleus and incus, and all granulation tissue. The temperature jumped to 105° F., the pulse to 130 and the patient died four days later of leptomeningitis. An autopsy was not permitted, but he supposed that he had removed granulation buds projecting through from the dura, thus opening up the mouths of vessels, through some one of which a septic embolus was carried and deposited in the meninges, where it set up a septic focus.

Furthermore, a facial paralysis might happen to anyone, as it is never known whether normal or pathologic osseous deficiencies exist. With facial paralysis and leptomeningitis as possible sequelae, it is not right to call it a minor operation, or to advise it when its curative possibilities are so much less than those of the radical operation.

He did not feel safe in operating in a hopelessly septic field, with poor drainage, as must be done in ossiculectomy, and he did not advise the operation.

Dr. T. H. Farrell said that in discussing the value of ossiculectomy, he would like to report a case of a child 6 years of age, who contracted scarlet fever seven weeks ago. She developed acute suppuration of both ears. The malleus and incus of one ear were exfoliated in the fifth week, and of the other ear in the sixth week. She was deaf to all sounds, either by air or bone conduction.

He would like to ask Dr. Knapp if he thinks any further operative procedure would help to restore hearing.

Dr. G. Hudson-Makuen desired to report a case of a lad of 15 years, who had had a purulent otitis media since infancy. Nature had removed every vestige of the drum membrane and the ossicular chain, but there still remained a slight

odoriferous discharge from the region of the attic. Small cholesteatomatous masses had been removed from time to time, and careful treatment had been employed, but in all these years he had not been without an odoriferous discharge, which has been variable in quantity. At present, it is very slight, and barring a slight deafness in that ear, there are no other symptoms whatever. He would like to ask the essayists what, in their opinion, would be the probable outcome in this case, and whether a radical operation is indicated?

Dr. Talbot Chambers stated that the brilliant results obtained by Dr. Bryant were duly acknowledged. But he felt that it is a very wise precaution, when working in the tympanum, to have the force applied from within, in removing bone from the inner end of the auditory canal. For this purpose, he employs a curette with a knife-cutting edge which is pulled against the bone to be removed. This avoids the danger of directly wounding the facial nerve, or splitting or cracking the facial canal and, secondarily, injuring the nerve.

Dr. F. B. Sprague said, regarding the suggestions of Dr. Dench, in reference to careful physical examination, that, having been a general practitioner previous to his special practice, he naturally yielded to the habit of physical examination in all cases in order that all other possible disease might be ruled out or taken into consideration. He was sure that many mistakes and hasty and unnecessary operations had been avoided in this way.

Dr. Arnold Knapp, in closing, said, regarding Dr. Myers' question, he thought that facial paralysis in chronic purulent otitis was an urgent indication for the radical operation.

He regretted that the value of ossiculectomy had entered into this discussion, as this was really a subject for itself; he, however, wished to emphasize that ossicles were affected secondarily to the bony walls, and so in removing the ossicles better drainage and better facility of treating the remaining disease are obtained, but that is all.

In reply to Dr. Farrell's question, the labyrinth was presumably involved in his case, and an operation would not improve the hearing.

Dr. E. B. Dench also spoke in the discussion.

Dr. Stucky said that, undoubtedly, the displeasing results following the mastoid operation, whether it be the classical

or radical operation, is due to some infected focus, which was not removed, or some fault in the technic. In cases of unusual elevation of temperature from 101° to 104°; with no evidence of reinfection, in which the condition of the wound is all that could be desired, he had found the cause to be intestinal toxemia. Two cases of severe pain in the ear and mastoid region, persisting for two days after the operation, were found due to diseased teeth, upon the extraction of which pain and temperature immediately subsided. He, also, was more inclined to favor conservatism than ultraradicalism. The most conservative thing to do when confronting a pathological condition of the mastoid cells, is to thoroughly remove this condition. There is a time and place for ossiculectomy, but both are uncertain, and this should be made clear to the patient before operating. Both brilliant and humiliating results follow ossiculectomy. The appearance of the drum membrane is by no means a safe criterion to go by in deciding upon the operation. In many cases, the best course to pursue can be decided by carefully weighing all the symptoms, but it is safe to conclude to operate one day too soon rather than an hour too late.

Dr. Phillips said he had not only considered the question of doing the intratympanic operation in selected cases, but had been actually performing such operations, endeavoring to so diagnosticate as to practically decide whether this simpler procedure would suffice, and while he was not able to clearly define just the diseased condition which would be met by the intratympanic procedure, he had, in quite a large series of cases, affected a cure by the method. He believed the time would come when the radical operation would be performed only in the severest cases. Among the conditions which always necessitate the radical procedure are, extensive granulations and prolonged and excessive fetid odor. He had recently operated by the intratympanic method in a patient where his assistants, without exception, believed that failure would ensue, and that the radical operation should be performed. The operation, however, was perfectly successful, and healing is complete to-day.

PAPER:

ACUTE OTITIC CEREBRAL ABSCESS, WITH NOTES ON TECHNIC AND DIAGNOSIS.

CHEVALIER JACKSON, M. D.

John D., aged 33, a millworker, was sent to me by Dr. W. Frederick, who had diagnosticated mastoid empyema with a suspicion of brain complication. Two weeks before, there had been a blow on the head while intoxicated. When sober, the next day, there was an ordinary acute rhinitis, and pus was discharging from the left ear. About a week later somnolence was first noticed. The patient could be roused and talked clearly, but soon lost interest and dozed off to sleep again. He denied all pain.

On the 19th day of the disease, with the assistance of Dr. Ellen J. Patterson and Dr. L. S. Walton, I opened the mastoid. The bone was not much broken down; there were three or four pus pockets of small size in scattered locations. The inner table over the sinus being normal, was not removed. The tegmina were both roughened, but no perforation large enough or straight enough to admit a fine probe could be located.

After operation the patient's condition was unimproved. In the next few days his mentality grew worse and his somnolence increased. Ocular examination by Dr. Glendon E. Curry was negative. Dr. John W. Boyce examined the patient and reported as follows:

"Patient lies in a somnolent condition; may be sufficiently aroused to understand questions, but there is evident obscurity of intellect. Great difficulty in holding his attention; sometimes commences a sentence correctly and intelligently, but wanders off into meaninglessness before finished. In some instances performed an act as requested while his attention was held, but continued to do it automatically, or in response to a request for some other act, when attention had wandered.

"Strong and unpleasant odor noticed as the bed is approached.

"Pulse about 72, changing in rate momentarily as patient moves or as his attention is attracted. Size moderate for a man of his weight and development; tension somewhat increased, but not markedly so (172 mm.)—not a marked and typical pulse of intracranial pressure, but tending that way. Heart and lungs normal.

"Protrudes tongue in the middle line. Patellar reflex more readily elicited on right side than left. Apparently more tone in left leg than in right. Cremasteric reflex present on left side, not elicited on right; impossible to test strength of grip. During about 15 minutes, patient wiped off his mouth, tried to button his night-dress, and drew up bed-clothes with left hand; nothing but apparent aimless motion with the right hand, which for the most part lies still, and slightly contracted.

"Urine retained, rendering catheterization necessary; bowels move involuntarily.

"While the paresis of the right side is not as certain as I could wish, even without it, the symptoms seem to me sufficient to justify a diagnosis of intracranial mischief, probably abscess of temporo-sphenoidal lobe."

Acting on this advice (23rd day of disease), I enlarged the mastoid wound upward, and, elevating the dura from the petrous bone, it was found tightly adherent over the tympanic roof. This adhesion was not disurbed. The bone opening in the squama was carried upward for about 3 centimetres. On reflecting a dural flap a whitish spot was seen on the median temporal gyrus. Inserting a scalpel through this white spot about 15 mm., no pus followed. Inserting the brain explorer to the same depth in the path of the scalpel, and separating the blades, creamy yellow-greenish pus of "laudable" odor flowed freely, probably an ounce and a half in all.

Dr. Boyce took sphygmanometric readings during this operation. The chart is shown in the cut, and his remarks are given farther on.

The "cavity" was packed with gauze, which was easily and gently placed while the tract was dilated with the brain explorer.

Bacteriologic report by Dr. Joseph H. Barach: "Streptococci in pure culture."

The packing was renewed daily and the "cavity" was once explored with the little finger.

On the fourth day after the brain operation, Dr. Boyce, mainly on the strength of a rise in blood pressure, as shown by the sphygmanometric reading, to the height registered before operation, advised further operation.

The accuracy of this operation was demonstrated by my finding a pocket that was not draining properly.

On the fourteenth day after operation, the patient, who had been conscious and mentally improving, during a few moments' absence of the nurse, tore off the bandage, clawed off the brain hernia and tore the meninges. When asked why he did it, he said his "head was itchy." Other questions were answered intelligently. He was not delirious. The temperature shot up to 104° and the pulse to 130. He became comatose again, and died two days later.

Report of Autopsy by John W. Boyce, M. D.

Cerebro-spinal fluid very turbid. No signs of meningitis. The membranes were tightly adherent over the tympanic roof, but no brain fistula existed at this location. Abscess cavity seems to have destroyed the brain tissue indicated in the diagram. Heavy line shows the opening through the cortex; the dotted one, the entire extent of the abscess cavity. These openings were larger than indicated, but this was apparently due to swelling of the middle temporal gyrus. I think there was no destruction of tissue, beyond the limit marked out. The abscess communicated with the ventricular cavity by a large opening into the descending cornua near its base; that is, close to its junction with the body of the ventricle. From the appearance at the time of autopsy, I would assume that the ventricle had ruptured outwardly into the abscess. Abscess was comparatively clean, and there was no evidence of further necrosis.

In reviewing this case, there are a number of criticisms the writer wishes to make on his own technic, especially in view of the fact that his later and more successful work has demonstrated improvements.

As pointed out by Jack, packing the "cavity" with gauze or even wicking the wound has never proven satisfactory. The writer has never yet removed gauze drainage from the

brain that pus did not follow it out. It had been acting as a dam, not as a drain. Of course, it had maintained a fistula, which was of advantage, but there is always some adhesion to the walls of the fistula. There is no adhesion to the cigarette drain, and a large, smooth-walled fistula is soon established, through which brain sloughs and debris are extruded at each dressing, much as clots are expelled by the post-partum uterus. The less meddling with the interior of the brain lesion the better are the results, in the writer's experience. Irrigation may scatter infection, and it is unnecessary. Shortening of the drainage only after a good fistula has been formed assures efficient drainage while the fistula is healing from the bottom.

Enlarging the mastoid wounds, soft and bony, upward is not so good a procedure as entering through a tongue-shaped scalp flap, base forward and independent of the mastoid wound. The latter method greatly simplifies the subsequent dressings, as the brain wound can be dressed first and kept in every way cleaner and freer from infective risks. It may be argued that both wounds contain the same organisms. They may and they may not, but even if they do, the virulence of the same organisms in the two wounds may differ greatly. True, extending the bony wound upward from the mastoid wound enabled the finding of the adherent dura over the tegmen tympani, but had this not been found I would have explored the brain in the same way. The only disadvantage of the separate wound method is in drainage of extradural abscesses in the middle fossa; but if this condition is suspected, it is easy to enlarge the bony wound downward. The time element is not a factor, as with the writer's ratchet trephine a ¾-inch bottom of bone can be removed in five minutes, and three minutes more with the rongeur will usually make a sufficiently large opening, 2 inches in diameter if so desired.

In a case where pus is found it is an inestimable advantage to have a separate field and primary union. Opening the brain on a day subsequent to that of the mastoid operation assures asepsis, and in weak cases the shock from loss of blood is less. But little blood is lost in the brain operation.

The insertion of a scalpel in this case was an unusual procedure with me, as I never use anything but the dilating forceps which I devised a number of years ago for this purpose.

The presence of the white spot in the cerebral cortex is my excuse for varying from what I have always advocated, namely, exploring the brain posterior to the located site of the abscess, in order to get the aid of gravity in drainage in the dorsally decumbent patient.

This is contrary to the teachings of the best authorities, who advocate drainage through the minimum amount of brain tissue, but it seems to the writer that efficiency is the criterion; and with a cigarette drain the posterior drainage has yielded me the best results. With this cigarette drain a little longer or shorter tract makes no difference.

The use of the little finger for exploring purposes I am convinced is a mistake. While no harm came of it in this case, I am certain that there is considerable risk of the bulk of the finger increasing intracranial pressure and a still greater risk of disturbing the protective sealing together of the meninges by which they obliterate the arachnoid spaces around the meningeal opening. Of course, a very large dural flap and a more dexterous finger than mine doubtless make it safe. Dench uses it, and no operator in the world gets better results than he does.

So much for criticism of my work. Coming now to other points, it would seem that the glancing blow of a chisel such as I use, with rounded basil, conveys no shock to the brain. Few men realize that a chisel must be sharp. With a dull chisel driven in perpendicularly to the surface by hard blows of the mallet, great harm may be done in some cases. Frequent light taps only are needed for a sharp chisel, which should be held at the farthest possible from the perpendicular. The rounded corners prevent injury to the dura, nerve, sinus or canals. The gouge I never use.

The scattered pus pockets in the mastoid indicated to my mind an infection of the mastoid by the blood vessels of thrombotic or more likely embolic origin. The brain lesion, however, evidently originated by pyogenic extension, as shown by the adherent dura, the tract subsequently closing.

The finding at the autopsy of grounds for the assumption that the ventricle had burst outward into the abscess is interesting and unusual. The clinical observations certainly corroborate this view. Favoring factors were the skull and dural openings, the weakening of the ventricular wall through disease, all of which furnished the point of least resistance

through which bursting occurred upon a slight increase of intra-ventricular pressure, due to either occlusion of the foramen of Magendie, serous meningitis, or other cause.

The interesting points in this case are:

1. The extreme rapidity of the abscess formation. Cerebral symptoms became manifest one week after the first appearance of the discharge.

2. The coincidence of the blow on the head—possibly a factor only by reason of increased vulnerability. No route of infection, or sign of traumatism was found. This is the fourth case of brain abscess with a history of a blow on the head that has occurred in my own practice.

3. The advisability of overhead turns of the bandage firmly fastened together with adhesive strips, especially in unruly patients. In addition, if constant special nursing is impossible, commisoles are necessary in some cases.

4. The sphygmanometric demonstration of:
   (a) The harmlessness of the chisel of the kind and in the manner used.
   (b) The necessity of accurate blood pressure observations in all brain abscess cases.

5. The value diagnostically of a peculiar fetor of the breath. Not the fetor of faulty metabolism or autointoxication. The laryngo-otologist will be better able than others to distinguish the peculiarity.

6. The bursting of the lateral ventricle into the abscess "cavity."

In appending the following notes by Dr. John W. Boyce, I would state that the aid of a nonsurgical medical attendant is of paramount importance. This is conspicuously true of auscultatory percussion. It is only of value when done by one whose ears are trained in physical examination of the chest. We otologists spend much time training our fingers and our eyes, and occasionally our noses, but rarely do we train our ears. I am unwilling to trust my hearing, though I will and do trust my eyes and fingers to any extent. In chronic suppurative ear disease, I feel confidence in my sense of smell to differentiate between osseous necrosis and saprophytic processes. If auscultatory percussion is attempted by otologists it will never be accorded the place it deserves in the diagnosis of brain abscess.

NOTES ON DIAGNOSIS BY DR. JOHN W. BOYCE.

Auscultatory Percussion of the Cranium.—To practice this the patient should lie high on the operating table, the head supported by a small hard pillow under the muscles of the neck so that vibration may not be "stopped." The stethoscope should be applied to the forehead, or to a bald or shaven spot in the middle line. Percussion of moderate force is to be made alternately at corresponding points on the two sides of the head. In certain cases a surprisingly marked and definite area of dullness will be found on the affected side. When heard, it will powerfully influence the mind in favor of the diagnosis. It is impossible as yet to say in what proportion of cases this occurs—how much weight should be attributed to its absence—or how useful it may prove, on further experience, for localization. All that can be said, is that in certain cases it is of positive value, and that it deserves more general consideration than it has received.

Unilateral Paresis.—In two of Dr. Chevalier Jackson's cases of abscesses located in the motor area, I have observed that the capacity for any but the simplest movements was much diminished on the opposite side of the body. Owing to the delirium or stupor often present, this symptom is not so obvious as would be anticipated. We are particularly apt to be misled by the fact that if the dynamometer be firmly placed in the affected hand, the patient can exert the ordinary degree of pressure on it. The paresis extends to the muscles of the face, but may not be apparent because of apathy. If we can excite motion in the face, we are apt to be misled by the fact that emotional expression is quite frequently asymmetrical in normal subjects. Even the Venus of Milo had a crooked face. To elicit this symptom, the best plan is to seat an unskilled and unprejudiced observer at the bedside with a sheet of paper ruled for the right and left sides, and instruct him to note in order, every motion made by the patient for several hours. In one instance, fifteen minutes of this sort of observation cleared up a case that had been very obscure.

Blood Pressure.—It is only in brain surgery that a sphygmomanometer seems to me an indispensable instrument from the practical point of view. Organic lesion is apt to be attended by general intracerebral pressure, and the blood ten-

sion rises in correspondence. No particular importance attaches to the first reading. We never know the normal standard of our case, and there are always some incidental circumstances whose effect we cannot exactly gauge, but if observations be frequently repeated, it gives us a most important line on the progress of the case. In two cases of Dr. Jackson's (the foregoing case and one reported in *New York Medical Journal,* ———, 1906, C. J.), after evacuation of an abscess, blood pressure fell immediately to what we must assume to be normal in those cases. In the course of a few days, the pressure climbed steadily to the height attained before operation. Almost without aid from other symptoms, it was possible to say that there was pus shut up within the skull, and further exploration verified this opinion in both instances: In one, by opening a tract that was not draining properly; in the other, by disclosing a separate, and probably new formed abscess cavity.

Leucocytosis.—Leucocytosis ordinarily attends abscess. As it occasionally fails, its absence can never be of great negative value. In a recent case where subsequent operation showed at least half an ounce of rotten pus within the brain, two counts on different days showed only 7750 and 6600 white cells per cubic mm., respectively. The value of positive leucocytosis is much diminished by the fact that it may be produced not only by mastoid trouble, but by a suppurating middle ear of itself. Its great value would seem to be in traumatic and idiopathic cases. The question of abscess, however, sometimes arises after the middle ear and mastoid have been cleaned out. In this case, a rising or continuously high count should carry some weight, for it has been shown that after radical operation the count rapidly tends towards normal. Dr. Joseph H. Barasch, pathologist to the Eye and Ear Hospital, is now making some observations on this point, which will doubtless be given to the profession when completed. They show that a distinct diminution of the count can be observed within two days, and that, in ordinary cases, it probably approximates normal within two weeks. If, therefore, after operation, no such fall is noted, the surgeon should bear in mind the possibility of deeper mischief, though it is scarcely necessary to say that more than this would be required to justify opening the skull.

DISCUSSION.

Dr. C. F. Theisen said he had been very much interested in Dr. Jackson's paper, because, five or six weeks ago, he was asked to operate upon a case of brain abscess of the tempero-sphenoidal lobe, complicating suppurating otitis media.

The patient, a boy, aged 17 years, lived in a neighboring city, and had been apparently well up to a week before he was called to see him. His family physician, Dr. Collins, of Schenectady, attended him in November, 1905, for an attack of acute follicular pharyngitis. The patient had measles in March, 1904, and suppurating glands in the neck in 1902. He probably had an otitis media when he had measles, although the speaker could get no history to that effect.

A week or so before the operation, patient had an attack of acute suppurative otitis media, the tympanic membrane rupturing spontaneously. Two days later, the discharge, which had been profuse, stopped, and the patient became very drowsy, and by noon of the next day had sunk into a coma, from which he could not be roused. He was sent for on January 2, after patient had been in this condition for about thirty-six hours. He had also had several convulsions and had vomited considerably. His temperature at the time of operation was 104° and pulse 140. His condition, in fact, was so desperate that the operation was performed immediately. The usual mastoid incision was made, and carried forward so as to expose the squamous portion of the temporal bone. The mastoid antrum contained pus, but the cells were not particularly broken down. The middle fossa was then exposed. The dura was not found particularly discolored, and there was no marked bulging. On exploring with a needle, however, some pus was located, after carrying the needle forward and inward. A knife was then inserted into the lobe in the direction the needle took, and the abscess found nearly an inch in the lobe. The patient's condition during the operation was so serious that he had to be frequently stimulated. He rallied well, however, and the next day became rational and asked for food. His temperature dropped to 102° and pulse to 100. He continued to improve for several days, but then his temperature jumped to 106°, and he again lapsed into a condition of coma and died. Drainage had been good, because there had been a free discharge of pus from the wound. Cultures, taken at the time of operation,

were examined at the Bender Laboratory, and it was found that the infection had been caused by the pneumococcus, pure cultures having been obtained.

The infection in this case undoubtedly extended to the brain, through the tegmen tympani. He believed this patient must have had an old otitis media with necrosis of the tegmen, and the acute suppurative otitis media produced the acute cerebral abscess.

Dr. Chevalier Jackson said he had learned from Dr. Jack to beware of gauze drainage.

In a portion of his paper that he did not read, he referred to Dr. Jack's observations on the objections to gauze as a drain in these cases. In regard to the trephine, he used it only to get a start for the rongeur, with which he made as large a skull opening as desired, and for him it was the most rapid way, though he knew Dr. Dench's skillful fingers could do more rapid work with the gouge. It was the separate wound that he urged, not the manner of bony technic.

PAPER:

SOME DIFFICULTIES IN DIAGNOSIS OF MASTOID CASES.

TALBOT R. CHAMBERS, M. D.

In our local medical societies, we have been having meetings devoted to the discussion of mistakes. The discussions have proved so valuable, that I venture to report four cases, occurring in my practice in a short period of time, which have impressed me greatly, and their consideration, it is hoped, may have some value in provoking discussion. The writer may not have employed all the aids which are available, but he cannot refrain from complaining of the inadequacy or clashing of symptoms sometimes met with, in mastoid cases.

Case I.—Mr. K., aet. 32, was first seen by me December 19th. His family physician had recommended, two weeks before, that he have his mastoid operated upon. However, he temporized with daily applications of electricity to his mastoid. Finally, unable to stand the treatment longer, his family physician, Dr. Atwell, referred him to me.

I found him in a very exhausted condition. He was frightened, excited and hysterical, even to a panic. For several days he had been unable to name properly the ordinary things in daily use. He called everything stuff. His shoes, stockings, a book, a watch, each he called stuff. But on hearing the proper name, his face would brighten and he would repeat it, to lose it again. His memory was becoming confused and faulty. All these were symptoms of sudden growth, abscess or tumor in the region between the ocular and auditory centers of the brain. The sight was not affected nor was the hearing markedly affected. Yet headache was all referred to the left mastoid region.

The auditory canal and middle ear did not look abnormal, but there was marked sensitiveness to pressure over the left

mastoid tip and antrum. The fundi oculi were normal. Temperature 100°, pulse 120, respiration 25.

It required stern persuasion to get his consent to operation. However, he took the anesthetic quietly, and the immediate recovery from the operation was good. Spinal puncture showed that fluid clear as water.

Operation consisted in a thorough mastoidectomy without finding any pus or disease. The sinus was bared, as was the middle cerebral lobe. Both appeared perfectly normal in color and to the touch.

At this point I argued that the clearing out of the mastiod, where all his pain had been, though nothing pathognomonic had been encountered, would be followed by relief of symptoms. I felt he had in his hysteria, exaggerated the symptoms—the otitic aphasia and loss of memory. And so I resisted the temptation of exploring the brain substance under its apparently normal exterior. I only partially closed the wound and put the patient to bed, to await recovery or localizing symptoms. I felt that if he died after I had, in vain, plunged the knife into his cerebral substance, I might charge myself with being accessory to his death. Just here was my mistake; for on the fourth day, when all symptoms were seemingly improving and he was gradually beginning to regain the ability to name things, he suddenly became worse, the temperature jumped from 101.5° to 104°, and he died.

No post-mortem was obtained. His abscess or growth must have been in the left parietal region. Mills and Weizenberg (J. A. M. A., February, 3, 1906) have eliminated the prefrontal region. The knife should have explored the middle lobe and possibly a valuable life would have been saved. A microscopical examination of the spinal fluid might have shown an increase of leucocytes and the blood a high polymorphonuclear percentage.

Dr. M. A. Starr's masterful paper, read before the New York Academy of Medicine, February 1st, made me hesitate to confess my shortcomings in this case.

Case II.—A girl, 16 years old, was brought to Christ Hospital with a history of three weeks' illness, which began, I heard afterward, with a painful swelling in the left side of the neck at the angle of the jaw. This swelling, at first limited, later became disseminated.

On examination, the patient was recognized as very sick.

The head was drawn to the side by the right sternocleido muscle in spasm. The left muscle was relaxed. There was a diffuse swelling of the left side of the neck and pain on pressure over the left mastoid antrum. The auditory canal had its lumen diminished by the edematous swelling.

The mastoid was evacuated and the sinus examined. No pus was encountered. The sinus to look and feel was healthy. This patient was put to bed, also, to await results. The temperature, which was 105°, went down to 101°, but soon arose to between 103° and 105°. On the fourth day, a runaround on one of her fingers needed a second dressing. It had been dressed upon entering the hospital. The temperature keeping up and the patient becoming worse, it was decided to open the mastoid wound again on the fourth day. There was but little pus in the mastoid, but the bone about the sinus opening looked black. This was superficial and easily removed. The sinus looked and felt healthy. Nevertheless, a free incision was made in it and a copious flow of fluid blood occurred. The mastoid and sinus were packed with iodoform gauze, and investigation in the neck freed a tablespoon of pus, just posterior to the mastoid. The internal jugular and facial veins were exposed and found to be distensible and collapsible. The patient was put to bed and died in four hours, without coming out of the anesthetic.

Here was a suspected mastoid and sinus thrombosis case, with both normal. It was a simple septic case, starting with a runaround of the finger and complicated by pus in the neck. On the third day, the face looked like a case of malignant pustule or erysipelas.

Case III.—Mr. M., aet. 35. Also very sick; was just able to get to my office, where it was necessary for him to take the recumbent position, so weak was he. He had a history of several days' running from the left ear. Was unable to have the ear cleansed out. The canal was diminished in size by posterior swelling. Operated same day and found numerous foci of pus throughout the ivory hard mastoid, which was thoroughly cleaned out. It was necessary to remove the cells above and anterior to the canal. The patient was put to bed, and, except for some frontal headache, was most comfortable and would have been allowed to get up if he had not persisted in having a morning temperature of 100° and an evening temperature of 102°. The pulse between 80 and 100 and respiration 20 to 25.

In this case, the sensorium was perfectly clear. There were absolutely no symptoms recognized, except the temperature, which was accounted for by the family physician, Dr. E. T. Steadman, who felt it was due to ague, for which he had been treated previously.

On the tenth day, there was evident rapid losing of ground. Temperature, pulse and respiration mounted in the air and symptoms of pericarditis and pneumonia presented, and this patient died quickly. Both heart and lungs had been subjected to examination the day before and found sound. Here was another septic case. But where the pus was, I don't know. His heart had been the occasion of considerable worry in years previous, and the pericardium was possibly acutely susceptible.

Case IV.—Mrs. C., aet. 35, was seen by me, after having been advised to have operation, by four of the profession. She had a history of only a few days' illness and referred all her trouble to the left mastoid. I did a paracentesis and saw pus escape and ordered her to the hospital, where she was operated upon that same afternoon by my associate, Dr. Pyle. Temperature, pulse and respiration nearly normal. Her sensorium was perfectly clear. The pupils were dilated in the dark, but contracted in the light. She was certainly very sick, but I supposed it was an ordinary acute mastoiditis (suppurative).

The operation revealed the mastoid completely broken down and pus escaping from the posterior cerebral lobe. The mastoid was thoroughly curetted and the cerebral cavity flushed out and packed with iodoform gauze. On her return to bed, after operation, she was in good condition, but shortly had a profuse sweat and was restless all night. The urine was found to be 1034 sp. gr. and contained traces of sugar and albumen. The next day she passed into stupor, had severe pain in operated region and tried to get out of bed. This was followed by delirium, semicoma and death.

Here was an advanced condition of the mastoid in necrosis and in addition a cerebral abscess, which was not at all suspected. I feel that hereafter, I shall in every suspected mastoid case have the spinal fluid leucocytes counted, if there are any, and the polymorphonuclear percentage of the blood studied, especially where there are no localizing symptoms or they are very vague.

PAPER:

KELOID TUMORS.

GEORGE A. WEBSTER, M. D.

My interest in this subject was aroused by seeing in a clinical case, a negress, a keloid growth about the lobule of the ear. It had recurred, larger than ever, a few months after removal.

Synonyms. Cheloid, Kelis, Kelos; Fr. Cheloide; Ger. Knollenkrebs.

Description. We have a tumor of varying size, projecting above the level of the skin in a smooth, flat, hard, well-defined mass. In color it is white, pink, or in negroes, varying with the individual color of the skin.

Its extension in claw-like radiations suggested its name. These tumors grow slowly; become paler and harder with age. Exceptionally they may atrophy in old age. Pain is not common. Pricking, burning and itching sensations may occur. This form of tumor is comparatively rare.

Pathology. It is a variety of fibroma; an affection of the skin occurring in the middle and lower portions of the corium. We have fine dense bundles of white fibrous connective tissue. Blood vessels are few in the centre, but more numerous at border of tumor. Sebaceous glands and hair follicles are pushed to one side by the growth and often atrophy.

Its origin was formerly thought to be in the adventitia of the vessels and perivascular connective tissue (1). Later investigations do not support this theory of origin (16).

Etiology. Two forms have been recognized: the spontaneous or true, and the cicatricial keloid (2) (6). Probably all are cicatricial (5) (23) (3) (4), following some form of injury to the skin. The following have been mentioned: Perforation of ear lobule for ear-rings, scratches, blisters, scalds, burns, leech bites, mosquito bites, briar or nettle stings, acne, herpes or small-pox; in general, any traumatism or condition

leading to scar formation or to vesicular or suppurating eruption. The colored race most frequently suffer. This affection is rare in the very young; usually occurs in middle life; has been observed at all ages (2). All grades of society are subject. Certain families are predisposed. Occurs most frequently in tropics. Is not affected by sex.

Diagnosis. Keloid differs clinically from simple fibroma by elevation above the surface, smooth cicatricial appearance, sharp margin, tendency to form claw-like projections which stand out in relief from the healthy skin, tendency to recur after removal. Morphoea in raised patches may simulate keloid. Morphoea is a circumscribed form of scleroderma. It looks like a piece of old ivory set in the skin. It may be pink, yellow, brown or black. The skin is usually smooth and easily pinched up. It is surrounded by a tinted border of dilated vessels. The ear is not a usual site.

Prognosis. Treatment has been very unsatisfactory. "Excision of entire skin, covering surface with Thiersch's grafts has invariably failed to prevent relapse." The keloid recurs with increased size. Age favors involution and exceptionally spontaneous involution has taken place (1) (2). They usually persist through life. They may remain stationary or slowly increase in size. They do not interfere with the general health.

Treatment. Excision and cauterization are not to be practiced (5). Local applications of iodine, etc., to promote absorption are useless (2). Efforts to relieve by decreasing the vascularity with collodion or pressure have been tried. We are told that electrolysis in very small keloids will sometimes check the growth (1). The generally unsatisfactory results of treatment were shown, however, by the recommendation of Jackson in 1901 in his text-book on Diseases of the Skin, that these growths are best let alone.

Lawrence reported a case in 1898, where after two operations with rapid recurrence, he tried scarification, followed by pressure for several months. This was followed by an apparent cure, when reported, there having been no recurrence in a year (12). Theoretically, this would not seem a desirable method of treatment, and in the absence of further reports can hardly be recommended. Since the development of X-ray treatment, cases have been accumulating that show this to be the most effective treatment yet tried, excepting,

perhaps, that of radium rays. The actinic or Finsen rays, however, are reported to exert no influence whatever (21).

The following reported cases outline the results thus far obtained:

Harsha. (15) Keloid removed three times with recurrence larger than ever, under X-ray diminished to 1-6 size.

Ochsner. (20) Keloid under X-ray diminished to slight thickening.

Pancoast. (17) Keloid of lobule and helix of each ear in female mulatto, aged 27. Eighty X-ray treatments 6 to 10 minutes each. Improvement not marked.

Pancoast. (17) Keloid left auricle in colored female, aged 21. Sixty-five treatments X-rays 10 to 15 minutes each. Thiosinamin internally. Patient declared cured.

Pancoast. (17) Keloid right auricle and neck. Treated to prevent recurrence after removal with knife. Increased in size in spite of X-ray.

Boggs. (18) Keloid treated by X-ray 3 times a week for 6 weeks, twice a week for 4 weeks, occasionally for balance of year. Cured.

Williams. (19) Case with two small keloids. One improved under X-rays, the other more rapidly under radium.

Allen. (21) Three cases still under treatment. After thirty X-ray exposures tumors disappearing but not yet cured.

Morris and Dore. (17) Keloid under X-rays. Decided diminution in growth in some cases and marked relief from pain.

Varney. (8) Keloid recurring after three operations for its removal, under X-ray completely disappeared. No recurrence in one year.

Hyde, Montgomery and Ormsby. (9) Five cases keloid-like scar following burn. Decided softening and thinning but not complete disappearance of scar under X-ray.

Morton. (13) Keloid of neck in scar of variola pustule. Recurring promptly after being twice removed with knife; increasing in size to 2 inches long, ¾ inch broad, 1-3 inch high. X-ray three times a week. Thirty treatments. Result, nothing whatever remains of the keloid, the skin is soft and smooth.

Morton. (13) Keloid, length 3 inches, breadth ½ inch, depth ½ inch. Under X-rays for four months, complete cure.

Pusey. (10) Two cases of keloid treated by X-ray. One 2½ inches long, 1¾ inches wide, ½ inch high, nearly dis-

appeared in 11 months. The other diminished ½ under irregular treatments.

Summary. Of 24 cases 5 are reported apparently cured. 14 improved, 1 no marked improvement, 1 grew worse under treatment.

Conclusion. The X-rays afford the best method of treatment for keloid yet demonstrated.

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DISCUSSION.

Dr. John S. Kirkendall said that about a year ago he had operated upon a little boy for mastoid disease, and there developed in the eschar a keloid which he advised them to leave alone. In a case previous, where a keloid developed on the arm after an operation, he, with Dr. Morse and others, had tried electricity and removal with the knife, both of which aggravated the trouble. This little boy went elsewhere and consulted surgeons regarding the same, and was advised not to disturb it.

Dr. John F. Culp said that his treatment of keloid had been in the main very unsatisfactory. In the early part of his medi-

cal career, he had removed quite a number with the knife, but in every case there was a recurrence, so that the last condition of the patients was rather worse than the first.

About a year and a half ago, however, at the urgent request of a lady, he removed one of these tumors from the lobe of the right ear. It was of the size of an English walnut, and, she being otherwise a comely woman, it detracted very much from her appearance. In this case, he was careful to go into sound skin. There had been no recurrence, and he felt that after this lapse of time, it is hardly likely that there would be. He felt sure that this case was entitled to be classed among the five or six other cures that have been tabulated by Dr. Webster

Dr. Herbert E. Smyth stated that he had frequently seen scar tissue formation follow healing after the mastoid operation.

He desired to ask the writer if he could make any suggestions in regard to the treatment of wounds, with the view of avoiding the development of keloid.

Dr. John O. Roe said that about five years ago, a young lady, about 18 years of age, with keloid of the left auricle, was referred to him by her family physician. The growth followed the puncturing of the ear, about a year and a half before, for the purpose of wearing earrings. While the keloid was rather small, the doctor excised it, but it returned, when he excised it quite completely. On its second recurrence, the doctor referred the case to the speaker. The tumor occupied the greater portion of the lobe of the ear, and was about as large as a hazel nut. As excision had been useless, he resorted to the method of electric cauterization, using a slender point so as to cauterize the interior of the growth only, leaving the exterior intact. When healing had taken place, he cauterized remaining portion until the growth entirely disappeared. There had been no reappearance of the growth or had not been when he heard from the girl last, about three years ago.

This case illustrated the fact that the galvanic cautery may be of special service and sometimes successful in curing the disease.

PAPER:

A CONTRIBUTION TO THE STUDY OF TUBERCULOSIS OF THE TONSIL.

George B. Wood, M. D.

In the conclusion of a paper read at the Atlantic City meeting of the American Medical Association in 1904, I said that "the tonsillar tissue of the throat, because of its peculiar anatomic construction and its topographic relations, is more liable to become infected by tuberculosis than any other part of the upper respiratory tract." By the term "upper respiratory tract" I mean, the larynx, the pharynx and the nasal fossae, and also the mouth. I still feel that this is true, and the frequency of tuberculous infection of the tonsil is not realized by the general practitioner.

Stöhr was probably the first to call attention to the peculiar dehiscences which exist in the cryptal epithelium of the tonsils. While I cannot agree with his theory that these spaces in the epithelium are produced by the outwandering of leucocytes, there can be no question but that the protective properties of the epithelium are greatly lessened by this peculiar metamorphosis. Theoretically, it would seem that the minute foreign bodies, or perhaps microorganisms, could easily gain access to the subepithelial strata, because the separation of the epithelial cells is so great, and because the disappearance of a basement membrane or subepithelial connective tissue brings the epithelial cells themselves in direct relation with the parenchyma of the organ. The work of Goodale, Hendelsohn, Kayser and also Piera has demonstrated that this penetration of foreign bodies and bacteria through the cryptal epithelium is an actual fact. Dmochowsky found tubercle bacilli in the act of penetrating through the epithelial cells of crypts, and especially where the dehiscences were marked. In a series of experiments on hogs, published in the paper above referred to, I demonstrated that virulent tubercle bacilli easily infected the tonsils and invaded these tissues in preference to other portions of the throat.

After publication of this article, I made further experiments endeavoring to determine whether tubercle bacilli can pass through a healthy tonsil. Unfortunately, the majority of these experiments were failures because the inoculated guinea pigs died before sufficient time had elapsed for the tuberculous process to develop.

The following experiments, however, done at the laboratory of the State Live Stock Sanitary Board of Pennsylvania, prove that under certain circumstances, the tubercle bacilli may pass through the tonsil before a tuberculous lesion has had time to develop.

A small white hog was inoculated on November 28th with a virulent culture of tubercle bacilli by rubbing a cotton swab, saturated with the culture, over the surface of the faucial tonsils. The same procedure was repeated on November 29th. The animal was killed on December 2d.

The post-mortem showed no enlargement of any lymph glands and the viscera were normal as far as could be ascertained by macroscopic examination. The tongue, pharynx and all the organs of the neck were carefully removed in one piece and immersed in a 5 per cent carbolic acid solution for fifteen minutes. Under strict aseptic precautions the tonsillar lymph gland was removed from each side of the neck and ground up in a mortar with sterilized water. This mixture was injected into the peritoneal cavities of two guinea pigs.

Guinea pig A died December 30th, apparently from an infection of bite-wounds on the back. The internal organs showed signs of a general septic infection, but no tuberculosis could be found.

Guinea pig B was killed on March 9, 1905. Postmortem examination showed enlargement of the cervical lymph glands, enlargement and caseation of the bronchial glands and enlargement of the mesenteric glands. The lung contained numerous tubercles, some of which were caseous. The liver was friable, enlarged and dotted with a few tubercles. The spleen was very greatly enlarged and was infiltrated with numerous large tubercles. The omentum was thickened, nodular and greatly increased in size. Tubercle bacilli were found in the splenic nodules.

There can be no doubt that in this case we have an inoculation tuberculosis, as the lesion in the omentum and peritoneal cavity was at the seat of the injection. That the

first guinea pig did not show tuberculosis was probably due to the fact that the animal died of other causes before the tuberculosis had sufficiently developed to be recognized. In this experiment the tubercle bacilli passed through the tonsil to the lymphatics of the neck within five days after inoculation; in other words, even while in an apparently normal state, the tonsil was unable to filter out the living tubercle bacilli.

Theoretically, we can explain the entrance of inert foreign bodies into the parenchyma of the tonsil as due to the action of the faucial muscles and to the presence of a lymph current within the tonsil itself. During the act of swallowing, palatoglossal and palatopharyngeal muscles must compress the tonsil and force the centrally lying bodies toward the periphery. If a particle has gained access to the bottom of a crypt, it is pushed in an outward direction and finding no appreciable barrier in the differentiated epithelium, enters the tonsillar parenchyma. The lymphoid current in the tonsil itself is produced by the manufacture of lymphoid cells in the germinating follicles. The current, except for an occasional rupture of the cryptal epithelium, tends to carry the lymphoid cells into the lymph radicles and thence through the lymph vessels in the connective tissue trabeculae to the tonsillar efferents. An inert foreign body causing no reaction in the tonsillar tissue, passes along with the lymphoid cells until it is removed or destroyed by the phagocytic action of the more highly developed leucocytes. A living micro-organism, however, is probably destroyed as soon as it enters the tonsillar parenchyma, unless the dosage of the organism is sufficient to overcome the vital resistence of the tonsillar structure. The reaction which takes place upon the entrance of pathogenic germs results from the peculiar relation which exists between the tissues and toxines of the infecting germs. The great virulence of the streptococcic toxin causes necrosis and rapid death of the tissue. The lessened virulence of the staphylococcus permits more reaction, hence the outpouring of leucocytes with the formation of pus. The tubercle bacilli, when sufficiently powerful to resist the vitality of the tissues, produces a characteristic change, namely, the formation of tubercles.

The pathology of tuberculosis of the tonsils resembles tuberculosis of the lymph glands, but with a slight modification,

due to the tonsillar tissue possessing a remarkable resistance to bacterial toxine and an ability to rapid recuperation.

Bearing this fact in mind, the characteristic feature of tubercle in the tonsils is easily understood. In those cases which I thought to be primary, the tubercles were discreet made up of epithelial cells and giant cells, but with very little or no necrosis. Th peripheral zone of small round cells was also absent, or else could not be distinguished from the tonsillar tissue. The tubercle bacilli were very few, and in the majority of cases they could not be demonstrated. In secondary tuberculosis of the tonsil due to autoinoculation through the sputum, the lesion may show extensive necrosis and even tend to become confluent, though, as a rule, even with the vital resistance lessened as it is in phthisis pulmonalis, the tubercles are usually found discreet and lacking in necrosis The ease, however, with which the tubercle germ may gain entrance to the tonsil is shown by the fact that practically in every case of advanced tuberculosis of the lungs the tonsils are infected.

In spite of the frequency of the infection, a demonstrable lesion of the tonsils during life is a fairly rare condition. When ulceration takes place, I believe that the destruction of the tonsillar substance is due to a mixed infection, as undoubtedly the tuberculous lesion lessens the ordinary resistance of the tonsil to bacterial invasion.

Tuberculosis of the tonsil heals by fibrosis, and even in advanced disease, the tendency to the deposit of connective tissue around the tubercle can be very easily demonstrated. Staining with Mallory's connective tissue stain brings out this feature very prominently. The thickness and efficiency of this protective barrier depends upon the chronicity of the lesion. I am inclined to believe that in certain cases of fibroid tonsils in which there appears to be a fibrous nodule separated from the trabeculae of the tonsil, this nodule is very apt to be a scar of a previous tubercle.

The lymphatic drainage of the faucial tonsil runs directly to the upper deep cervical glands, which glands, by a rich system of anastomosis, are connected by efferents and afferents with practically all the lymph glands of the neck and head. The tonsillar lymph gland is generally situated just below the posterior belly of the digastric muscle where it crosses the anterior border of the sterno-cleido-mastoid. Topographically,

this spot is located just behind and below the angle of the jaw. In tuberculous adenitis of the neck, it is this gland that is almost invariably the first one to become enlarged, but subsequently any of the cervical glands, submaxillary, occipital, suboccipital, and even the parotid lymph glands, may become infected by a retrograde invasion due to the damming back of the lymph current. The natural course of invasion would be downward, involving the lower glands of the deep lateral chain until the jugular lymph trunk is reached and the infecting germ gains access to the blood. When the dosage is large and the germ very virulent, such a course is probable, but in the very large majority of cases of tuberculous adenitis, the dosage has been a small one and the lymph gland has had sufficient time and power to obstruct the invasion. The blockage of the normal lymph flow is due to the swelling of the infected gland, and this blockage causes a retrograde lymph current.

I would like to briefly call attention to the possibility of infection of the apices of the lungs by way of the lymphatics of the neck. A recent article by von Ruck, which is a review of the literature of pleurisy in its relation to tuberculosis and deductions from clinical observations by himself, show that the majority of so-called idiopathic pleurisies, both with effusion and dry, are due to the tubercle bacilli. There are two routes by which the pleura may be infected. First, through the lymphatics of the lung, which end in stomata opening into the pleural cavity. Fleiner has traced particles of India ink through these lymphatics, and Arnold and Zenker have found coal and metal dust in pleuritic adhesions. Second, and which concerns us more particularly, is the lymphatic route. von Ruck has injected the tonsil of a dog with India ink, and has traced the particles through the glands of the neck to the pleura. The peritracheal, substernal and mediastinal glands were also injected. To me, these experiments backed with certain anatomical and clinical knowledge, help to confirm the idea of direct infection of the apices of the pleura by the tubercle bacillus gaining entrance through the cervical lymph glands, and in a large majority of cases this infection must start in the tonsils. The supraclavicular lymph glands are in close proximity to the apices in the lung, and, according to Fleiner, receive efferents from the pleura. Also, the two glands which are generally

situated at the sterno-clavicular articulation are regionary to the apical pleura. It is a well known fact that the supra-clavicular glands are closely associated by anastomoses with the deep cervical lymph glands.

The following case has come under my observation, and is of interest as clinical evidence of the pulmonary infection through the tonsils:

I first saw Miss H. L., aged 26, on January 17, 1906. The history of this case is as follows: She had been perfectly well up until the 14th of last July, when she was overcome with heat while working in a laundry. Since then she has lost 27 pounds in weight. She had no cough and no throat or nose symptoms until December 22nd, 1905. At that time, the throat became sore, gradually getting worse until marked odynphagia had developed. Almost immediately after her throat became sore the right tonsillar lymph gland enlarged and was painful to the touch. The infection spread from this gland to others, of the upper deep cervical chain, also to the sub-maxillary glands, to the occipital and to the mastoid glands. The involvement on the left side of the neck was not so marked as on the right side, yet it was very distinct.

The examination showed a marked enlargement of the upper deep cervical lymph glands, especially on the right side. There was tenderness and enlargement of the right sub-maxillary glands and the occipital glands. A slight enlargement of the tonsillar lymph gland on the left side and tenderness and enlargement of a mastoid gland on the left side. A gland situated on the anterior border of the trapezius well down towards the base of the neck, on the right side, was enlarged and tender. This gland probably belonged to the supraclavicular group. Both nasal fossae were free, turbinals contracted and the septum deviated slightly toward the right. All her teeth which had not been removed were in good condition except one carious molar on the left side below. The uvula was somewhat enlarged and slightly edematous. The tonsils and lateral folds of the throat presented an appearance which is best shown in the drawing which I present. It will be noticed that the left faucial tonsil is partially destroyed, the destructive lesion being chiefly within the tonsil itself. A whitish necrosed area can be seen at the upper part. The right faucial tonsil is somewhat enlarged, of a normal appearance, except at the hilus where there is a slight amount of necrotic material. Both

lateral folds of the pharynx are infiltrated and enlarged to about three or four times their ordinary thickness, and in both folds there is a superficial ulceration, the borders of which are irregular, as though made up of numerous small tubercles The base of the ulcer is covered with a whitish secretion, which could be removed with a swab. The pharyngeal tonsil does not present any ulceration, though it is slightly enlarged. The lingual tonsil is enlarged, and presents two distinct ulcerated areas, each about the size of a dime. The epiglottis and larynx are normal as far as can be seen. The case seemed so interesting to me, being possibly one of primary tuberculosis of the tonsils, that, at my request, she presented herself for examination at the Henry Phipps Institute.

Dr. Flick, the director of the Institute, became also interested in the patient, and he afterwards re-examined her in his office and gave me the following report:

The pleura is adherent over both apices, a condition which has probably existed for some time. Besides this chronic pleurisy, there is a small lesion in the right upper lobe and also one in the left apex. These latter two lesions are probably recent, although this cannot be positively determined. Some impairment of resonance in the mid-scapular line suggests the possibility of enlargement of the peribronchial lymph glands.

A portion of the right tonsil was removed and examined under the microscope. Signs of an acute, though rather mild, inflammation were present, as shown by the marked diapedesis in the polymorphonuclear leucocytes. Scattered throughout the interfollicular tissue were a few small tubercles, in some of which typical giant cells were found. A number of sections were stained for tubercle bacilli, but only once was I able to find what I thought to be the specific germ, and smears made from ulcerated area of the throat were negative as far as the tubercle bacilli were concerned.

A summary of this case is briefly as follows:

Tuberculosis of the tonsillar tissues of the throat with an infection of the cervical lymph glands starting apparently in those glands which drain the faucial tonsils. Spreading of the infection both with and against the lymph current. Old adhesions of the apical pleura and lesions in the upper lobes of both lungs probably of recent date. It is impossible to say which lesion is primary, that in the lung or that in the tonsils, but I am inclined to believe that the tonsillar infection is the

original one, as the lesion here is much more advanced. Further, it is practically impossible for the pleural involvement to spread against the lymph current clear up to the tonsils, and sputum inoculation in this case is most improbable, as the patient never had any pulmonary symptoms. The distinct ulceration in the tonsillar tissue is undoubtedly due to a mixed infection, and it is only since the infection has taken place that the subjective symptoms, such as sore throat, have been present.

It has been impossible in this paper to enter into details concerning pulmonary infection from the tonsils. This method of infection has, however, of late been gaining in probability, and it is with the thought that perhaps a suggestion along this line might lead to further research, that I ask your pardon for having presented this rather inconclusive paper.

DISCUSSION.

Dr. Chevalier Jackson said that this was an exceedingly valuable paper. Dr. Jonathan Wright did some work in this line some years ago, and he, among others, had sent him at his request some tonsils removed from tubercular subjects. There were two questions he would like to ask Dr. Wood. Do his investigations show whether the spreading against the current is due to extension by continuity of tissue along the structure of the lymphatics, or to backing up of the flow from occlusion of the lymph channels?

He had two cases in which both the tonsil and the larynx were the sites of tubercular lesions, while the lungs were uninvolved. He believed the disease to have been primary in the tonsil in both instances, and would like to ask Dr. Wood if he could suggest an infective route other than the mucosal surface.

Dr. John O. Roe said that there was no question that in many cases the infection of tuberculosis enters through the tonsil. This cannot be wondered at if the condition of the diseased tonsils that come under our observation is studied. He believed it an undeniable fact that the mass of glandular tissue termed tonsils was a diseased process; the normal tonsil so-called, being, in health, simply a small collection of lymphoid tissue containing muciparous glands located between the pillars of the fauces, scarcely visible on inspection. The

crypts that are found in these diseased tonsils are formed by the infolding of this tissue during the process of enlargement. The more he studied this subject the more he was convinced that this opinion, first enunciated by Bosworth, was the correct one, and that the anatomic descriptions of tonsils given in textbooks is almost always that of a diseased process.

Usually the first evidence of the absorption of infectious material from the tonsils is an enlargement of the lymphatic glands just under the angle of the jaw, which are in direct communication with the tonsils. Also, when enlargement of these angular glands is found, a septic condition is going on in this tonsillar tissue, no matter how small or how much hidden from view by the pillars of the fauces it may be.

On excising a diseased tonsil one couldn't fail to be impressed with the extent of this diseased process, which so often forms a nidus for the incubation and growth of all sorts of pathogenic germs. In all such cases of diseased tonsils, and particularly when associated with incipient tuberculosis, it is of the utmost importance that this diseased mass be completely removed to prevent further infection from this source.

Dr. Case said that this valuable contribution teaches that a diseased tonsil is not a harmless thing to be made light of. It may not only harbor tubercle bacilli, but other virulent germs as well, and be the distributing point. He was sure that some of the autoinfections arise from diseased tonsils, and could recall a case where septic endocarditis and meningitis had their origin in a diseased tonsil. Some of the aural infections could also be traced to this origin, and in chronic suppurative otitis (the etiology and treatment of which has been so ably discussed this morning), the condition of the tonsils as well as the condition of the lymphoid structure in the naso-pharynx should be carefully investigated before resorting to the radical operation, as many cases never will get well until every vestige of disease is eradicated from the throat.

Dr. Geo. B. Wood said that operative procedures on the tonsils should be undertaken when there is a distinct indication for surgical interference. In that the tonsil belongs to the hematopoietic organs, its removal must be accompanied by some interference, however small, in the physiologic economy of the human system. He could not agree with Dr. Roe in believing that all tonsillar projections in the throat should be looked upon as diseased processes. The question of operating

on tuberculosis of the tonsil would be easily answered if the disease when it existed could be recognized, but unfortunately, in a large number of cases, the tuberculous process is not clinically manifest. The indications for operation must be recognized in the general condition of the patient and perhaps in the secondary local changes, chief among the latter being chronic enlargement of the cervical lymph glands.

The method par excellence of treating tuberculosis of the throat is through cauterization of the infiltrated areas with the electro-cautery. Of course, where a tonsil can be removed the disease is most easily eradicated by the more radical procedure, but in order to overcome the possibility of direct blood infection, the subsequent searing of the wound with some cauterizing agent is a very useful safeguard.

Dr. Phillips said he would not attempt to discuss this most valuable and interesting paper, but arose to congratulate the author, and also the Society in being able to place in its annals a contribution so worthy, and he desired to move that the Eastern Section pass a resolution recommending to the Society the importance of encouraging in every way original research in these specialties, and also that the Society urge its members to be willing to aid Dr. Wood and others by furnishing such specimens and histories as might aid them in their investigations.

PAPER:

REPORT OF A CASE OF DEFORMITY OF THE NOSE RESULTING FROM LUPUS; CORRECTED BY THE SUBCUTANEOUS METHOD.

JOHN O. ROE, M. D.,

The following case of lupus of the nose is of interest on account of, (1) the successful arrest of the disease after extensive destruction of tissue; (2) the marked deformity of the nose resulting from this loss of tissue and the cicatricial contraction; and (3) the subsequent successful subcutaneous correction of this deformity by the plastic method.

Mrs. E. A., of Minnesota, was referred to me by her family physician, November 27th, 1905, for the correction of her nasal deformity.

The history of the case is briefly as follows: Ten years ago she was attacked with lupus, the disease appearing at the same time on the face and on the right wrist. On the face the ulceration began as a patch under the right eye; later it extended to the lower portion of the nose and left cheek.

On the face and on the wrist the ulceration was superficial, confined entirely to the skin, but about the nose it extended deeply, involving the subcutaneous connective tissue, eating away a large portion around the end, extending up the sides, excavating both alae and giving the nose the appearance as if a portion had been literally bitten away by a wolf. The disease also extended into the nose, destroying the triangular cartilage.

The patient had been treated by her local physician with iodin and external cauterization, but without avail. She was then sent to Dr. Charles H. Mayo, of Rochester, Minn., who succeeded in arresting the disease by internal medication, consisting mainly, I believe, of guaiacol. After a considerable period the disease was arrested and, at the end of two years, entirely healed.

Two years later the patient was operated upon by a distinguished surgeon for the correction of the nasal deformity resulting from the lupus.

Under ether the doctor attempted to correct this deformity by a plastic operation, but was unsuccessful, the result being the complete obstruction of both nostrils, when cicatrization had taken place. Previous to this time she was able to breathe fairly well through her nose, but at the time I saw her both

Fig. 1.

nostrils were almost completely impervious to air, the only external communication being by a very small opening on the left side, near the upper part of the columna, through which a very slender probe could be passed.

On examination of the nose the end was seen to be cone-shaped, projecting downward, as shown in Figs. 1 and 2. There was a V-shaped contraction of the left ala, Fig. 3, and a somewhat rounded contraction of the right ala, as seen in the illustrations. The triangular cartilage of the septum was

gone; the turbinates were small and the interior of the nose was quite capacious. The bony framework of the nose was normal. There was considerable scarring of the face where the lupus had attacked the skin—which may be seen in the illustrations.

In the correction of this deformity but one ala was operated upon at a time; the first operation being performed upon the right side. In performing this operation, a vertical incision

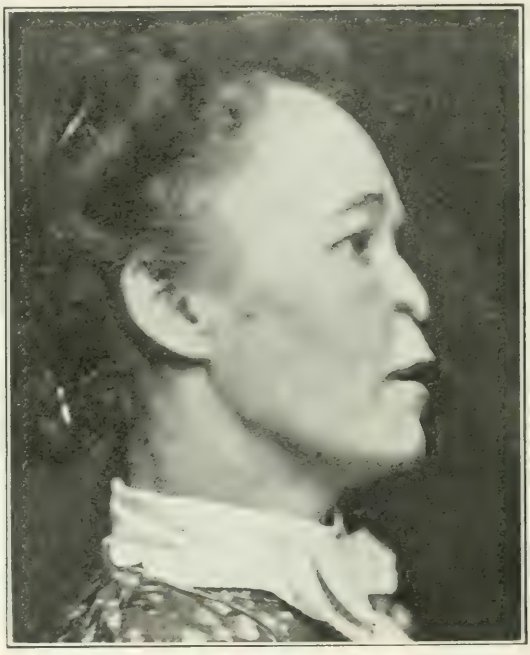

Fig. 2.

was first made so as to leave the central portion, the columna, of the normal width. The skin was then raised or dissected up, the incision being made on the inside of the nostril, to above the rounded mass of cicatricial tissue, on the right side of the nose, as shown in Figs. 1 and 2. A subcutaneous flap was then made of this mass of tissue which was turned down so as to fill in the defective portion and to form the normal contour of the ala. The skin was then sufficiently loosened to permit

it to be brought down or to slide down over this transplanted tissue, and permit the edge to be turned so as to form the border of the ala, and also to cover the denuded portion on the inside, in order that there should not be two opposing raw surfaces. The parts were carefully stitched in place, and an aluminum nasal tube introduced into the nostril, so as to maintain the normal size and shape until healed. When this side was

Fig. 3.

sufficiently healed the other side was operated upon in a similar manner, varied only by the slightly different conditions on this side; the redundant tissue at the end being utilized to fill in the gap in the left ala. After the skin had been raised, a flap was made of the redundant tissue in the end of the nose which was turned in to the gap in the left side, filling it completely.

A tube was also introduced into this nostril, and both tubes worn until healing was complete, leaving the nostrils in quite a normal condition, as will be seen by the Figs. 3 and 4, which show the condition of the nose after the operation. Two additional minor operations were necessary to remove inequalities

Fig. 4.

resulting from uneven healing, in addition to the careful and minute attention to details that were necessary until the work was complete.

The result in this case, it is needless to say, is gratifying both to the patient and myself, which on her part was about equally divided between the wonderfully improved appearance of her nose, and her ability to breathe through it, which she had been unable to do for six years.

I expected to be able to present the patient for your inspection, but she was, I am sorry to say, called home last week.

This was a little earlier than I wished her to go, as I wanted to be sure of the complete and symmetrical healing of the tissues before she left.

From later reports, received since this paper was read, I learn that, by the patient's wearing the tubes until all tendency to contraction of the tissues about the nostrils had entirely disappeared, the result has proved entirely satisfactory.

PAPER:

A CASE FOR DIAGNOSIS.

T. H. Farrell, M. D.

The case I present for your consideration is of some interest. I have watched it for over five years without making more than temporary diagnoses. It was seen by Dr. F. A. Bosworth, who made a diagnosis by exclusion of leukoplakia, but the subsequent history does not verify the diagnosis.

A. L. F. Deyo, male, aged 53, a farmer, living on the foothills of the Adirondacks, presented himself for treatment December 18, 1900. A year and a half prior to this he began to have sore throat. Ulcers would appear, heal and reappear. Dr. W. M. Gibson, of Utica, found a trace of sugar in his urine, and treated him for diabetes without result. Five months ago Dr. J. H. Glass, of Utica, diagnosed syphilis and put him on anti-syphilitic treatment, pushing it for four months, when he had lost forty (40) pounds and his throat was still sore. In the last month he has had an attack of shingles. His family and personal history are good.

At the time of my seeing him he complained of his throat being uncomfortable and there was pain in swallowing. On inspection his throat was found to be a good color. The right tonsil was the size of a hazelnut, normal in appearance, except for a small, round, superficial ulcer with a white base and a definite margin with a narrow red border. The left pillars and tonsil were red, the pillars thickened and nodular, the tonsil very hard. On the free edge of the posterior pillar were three superficial ulcers like that on the right tonsil, and on its anterior surface was a clean punched out ulcer without specially red margin. At the junction of the posterior pillar with the soft palate was a yellowish spot as if just ready to break down into an ulcer. The epiglottis was red and swollen with a superficial ulcer on the right side.

December 31st. The ulcer on the right tonsil has spread superficially. The left posterior pillar is more swollen and nodular. The three superficial ulcers are larger than before.

the yellow spot has become a superficial ulcer, the deep clean-cut ulcer has healed. Epiglottis looks normal. The right aryepiglottic fold is red and swollen and has a sharply defined depressed ulcer on its posterior surface.

January 3, 1901. The ulcer on the aryepiglottic fold is healed, and the swelling less. The left arytenoid is slightly swollen. The ulcers on the left pillar and right tonsil have spread over a greater area and the tonsil is swollen.

January 11th. Ulcer of right tonsil about the same size. Part of the base consists of a firm, white, closely adherent slough, the removal of which leaves a bleeding surface. Left faucial tonsil and pillars have almost entirely cleared up.

January 17th. Several small white spots have appeared on left posterior pillar and tonsil. These consist of a white elevation rising from a normal mucous membrane—are easily removed and leave a shallow ulcer. A large piece of white slough, which extended deeply into a crypt, in the right tonsil, was removed without bleeding. Slight redness and swelling of the left side of the epiglottis, on which was a small white spot—another white spot at the base of the tongue. Both arytenoids red and swollen. A white spot on processus vocalis of left arytenoid.

January 31st. Larynx and epiglottis look normal. Left faucial pillars and tonsil almost normal. Right tonsil greatly swollen—large, deep ulceration on anterior and posterior surfaces—base tough and white. Right posterior pillar red and swollen. Early in February the patient went to New York and consulted Dr. F. A. Bosworth.

February 19, 1901, Dr. Bosworth writes: I removed the projecting mass on the right tonsil and sent it to the laboratory and had it examined. The report was "Papilloma." This would seem to exclude cancer, lupus and tuberculosis, while Glass' treatment excludes syphilis, it seems to me. My impression at first seeing the case was that it was epithelioma—but there was so little induration that I was doubtful. Accepting the microscopic report, I can make but one diagnosis, "leucoplakia tonsillaris."

You see the obscurity of the case to me, and I merely write the means on which I reached the conclusion.

I have removed all the growth with the snare that I could, and subsequently went over it very carefully with the galvano-cautery.

I have no suggestion to make further than to watch the case and, in case of a return of the disease, to destroy it with the galvano-cautery or some chemical agent.

I have seen a few cases of leukoplakia of the mouth—in which chromic acid did better than anything else. The main danger of this affection is that it may change into epithelioma.

March 5, 1901, Dr. Bosworth writes: I know of nothing that promises better for the patches in Deyo's case than the galvano-cautery. The essential thing is that it be thorough. The prognosis in these cases is rather bad. They return and return in spite of everything—and finally they turn into epithelioma. The best promise of arresting the disease is in the galvano-cautery, and this is because the galvano-cautery does its destructive work more thoroughly than any other destructive agent.

My diagnosis, I think, is correct, and yet it was only by exclusion. It is said that leukoplakia is a mouth disease, and does not appear behind the anterior pillars, and yet considering the history of the case—the microscopic character of the growth, and the appearance—I certainly believe it is the only diagnosis. What else can it be? And it recurs in the characteristic way. I would keep it up with the cautery, and, if you do it deep enough, I believe you will stop it.

June 3, 1901, Mr. Deyo writes: I am very glad I can write you that my throat is completely cleared up. I am satisfied that the soreness came from below where I could not see, and that has now healed, and I feel nothing only a little fullness or swelling, which is fast disappearing. I am working hard—and sometimes in the rain—and weigh 150 pounds in shirt-sleeves.

December 20, 1901. Pharynx and fauces clear and smooth. Epiglottis red and swollen with a deep ulcer on the right side and a shallow ulcer on left side. Cauterized freely with electro-cautery.

January 13, 1902. Epiglottis healed; ulceration in right pyriform fossa. Cauterized thoroughly.

January 19th. Right arytenoid red and swollen; ulcer on superior surface; cauterized with electro-cautery.

January 22, 1902, Dr. Bosworth writes: These cases are exceedingly obstinate and trying, as you observe, and require the most active measures. I have never known of such

a thing as extension into the larynx, and I doubt if it is a complication to be feared. There is recorded the danger of its developing into epithelioma, but I have never seen any such tendency.

November 26, 1902, Mr. Deyo writes: My throat is behaving beautifully and I scarcely know it is sore at all. Have no trouble about eating (only to get enough), and if it continues to improve as it has done lately I think it will be as good a throat as anybody owns. I think under the circumstances that it will not be necessary to go to see Dr. Bosworth until I can take my diploma (the two years' treatment) with me.

November 18, 1905. Since that time Mr. Deyo has had periods of quiet with no appearance of ulceration or inflammation alternating with periods of exacerbation, involving the posterior pharyngeal wall, epiglottis and aryepiglottic folds. The fauces have remained free.

I wrote to a bureau in Washington for all the literature they could find on leukoplakia in the Surgeon General's Library, and received the following:

LEUKOPLAKIA.

The patches are limited to the buccal cavity, and generally found on dorsum of tongue or inner surface of cheeks and lips, but seldom, if ever, on lower surface of tongue or back of anterior pillars of the fauces. They consist of one or more small irregular or oval spots which may become confluent. A considerable portion of tongue alone may be involved, or dorsum of tongue, buccal mucous membrane and the gums one and all may be affected. The first appearance of the white patch is preceded by hyperemia, and subsequently in the early stages a hyperemic areola is found about its borders. Before long the patch itself becomes thickened, sometimes to the extent of 6-8 m.m., and the epithelium which has become hard and dry may be easily removed, or in spots it may be spontaneously exfoliated, leaving the appearance of an ulcer. The surface of the patch is marked by numerous fine lines or furrows which by intersecting each other divide it into small polygonal spaces.

Excessive smoking is reckoned as a cause.

PROGNOSIS.

The duration of the disease varies from a few months to several years. The majority of cases terminate in epithelioma, which runs its course to a fatal issue.

LEUKOPLAKIA.

Moritz Schmidt, in his text-book, "Die Krankheiten der oberen Luftwege," Berlin, says on page 174: A thickening of the epithelium, leukoplakia oris, occurs not only on tongue, called here leukoplakia linguae, but also on mucous membrane, lips and cheeks in the form of mother-of-pearl spots which generally extend over not a little of the mucous membrane. On surface of tongue occur sometimes only small spots, somewhat deep, which may exhibit the mother-of-pearl color more or less.

On the under-surface occur circumscribed grayish white thickenings of the epithelium, which have the greatest similarity to the gray condylomata of secondary syphilis, with which they are all the more likely to be confused, since it is in syphilis, and after a course of mercurial treatment they are most often found. When these gray spots occur on the tongue only, unaccompanied with appearance in other parts of the body, one cannot, according to my opinion, conclude from this alone that active syphilis exists, entirely apart from the fact that they occur in other chronic irritations of the mucous membrane; for example, in smokers who have never had syphilis.

Schmidt adds: "I would remark also that many persons see in leukoplakia a disposition to cancer. This is a point which the general practitioner is better enabled to clear up than the specialist, as he observes the patient from youth up."

The only literature that I have seen, aside from the meagre notices of leukoplakia in the text-books, is an article in the Transactions of this Society for 1902 on "Leukoplakia Buccalis, with report of a case treated with X-rays," by Otto J. Stein.

In summing up he says: "The appearance of the disease as usually first recognized is that of pearly-white or milk-white irregular plaques or patches of varying size, smooth and glistening, causing no discomfort whatsoever, appearing

anywhere on the mucous membrane of the cheeks, lips, gums, tongue, palate and fauces. Later they become more thickened and hence elevated; also, more hardened until they may present a rough and pitted surface, hornified to the feel and markedly elevated. Either one of these two conditions may begin to fissure and finally ulcerate, resulting in a very painful affection."

This is very different from the condition in Deyo's throat. Here the disease did not pass in front of the anterior pillars. The ulcers were preceded by small yellow spots under the surface, or by small white tufts, which were soon thrown off. A peculiarity of the disease is, that while apparently perfect healing takes place in one locality, it breaks out in another not contiguous. He has had long intervals when no evidence of the disease could be seen.

The only treatment that has been of any use, is that suggested by Dr. Bosworth of thorough cauterization, and the more thoroughly it is done the more promptly the healing process.

The patient is here for your inspection and diagnosis.

In discussion, Dr. Theisen of Albany, and Dr. McCaw of Watertown, suggested that it might be a case of Vincent's angina.

DISCUSSION.

Dr. C. F. Theisen said: Dr. Farrell's case is of great interest, and certainly presents many diagnostic difficulties. From the history of the case, and the fact that iodid of potash has done the patient no good, it seems to me that the patient may have Vincent's angina. This condition of the throat is difficult to diagnose, and the diagnosis can sometimes only be made by exclusion. The finding of the characteristic fusiform bacillus or spirillum of Vincent would clear up the diagnosis.

It is most difficult at times to differentiate this condition from pharyngeal syphilis, but in Dr. Farrell's case the fact that iodid of potash has done no good seems to settle the fact that it is not syphilitic. The patient's fairly good general condition is against tuberculosis.

I have seen several cases of Vincent's angina, one in my own practice, which was not recognized until Emil Mayer's paper on Vincent's angina was published. I believe Mayer was the first in this country to describe this condition.

Dr. Geo. B. Wood said: In connection with this case of Dr. Farrell's, I would like to mention a patient who has been under my care for half a year or more. He had had both tuberculosis and syphilis, but the lesion in his throat seemed independent of either of these specific infections. It was characterized by the presence of superficial ulcerations on the pillars of the fauces, the surface of the tonsils and the soft palate. Cauterization of the lesions generally cured them. The condition may have been herpetic, as the ulcers were very apt to get worse during outbreaks of herpetic eruptions on the skin, to which the patient was liable.

PRESENTATION OF CASES.

MODIFIED RADICAL OPERATION.

Dr. W. Sohier Bryant presented a case of "modified radical operation" where the exenteration of the mastoid process and cells was carried as far as possible without disturbing the attachments of the membrana tympani or ossicles. The noteworthy points in the operation were that the posterior meatal wall was removed to the annulus tympanicus, which was left intact; the posterior fan-shaped ligaments of the incus and the posterior articulation of the ossicle were not injured; the zygomatic cells and epitympanic space were thoroughly opened by the removal of the posterior and middle root of the zygoma and the hanging meatal wall. At the same time, the upper part of the annulus was carefully preserved intact and the attachment of the superior ligament of the malleus was not touched nor the external ligament interfered with. The special points in the result of the operation were the extremely rapid convalescence and the restoration of hearing to what is the normal for the other ear.

The patient, a young man, 17 years old, was operated on last August at the New York Eye and Ear Infirmary. The history of the case was one of repeated attacks of purulent discharge. By pain, swelling and tenderness, the present attack gave signs of mastoiditis, lasting six weeks. When first seen, the temperature was 100-4/10°. There was extensive swelling above and behind the auricle, tenderness over the mastoid region and purulent discharge from the meatus.

The operation was commenced by an extensive "U" cut in the membrane. The mastoid process and cells were removed. During the course of the operation, the dura was exposed over the knee of the sinus and the tegmen tympani.

The smear from the mastoid pus showed a mixed infection. The aural pus showed diplococci. The wound was closed without packing.

On the first day, the temperature was normal. On the second day, the packing was taken from the canal. On the third day, the patient was up and dressed. There was no discharge from the ear. Nearly all of the post-aural wound had healed by first intention. On the fifth day, the fundus of the canal was nearly dry. On the eighth day, the patient went home. On the tenth day, the membrana tympani was healed and closed, the fundus of the meatus was dry, and the post-aural wound healed, except at one point. On the eleventh day, all the wound was scabbed over and healed. On the fifteenth day, the post-aural wound was epidermatized. On the sixteenth day, the watch was heard thirteen inches. One hundred and thirty-five days after the operation, the watch was heard forty-six inches in the operated ear and fifty inches in the normal ear. There has been no pain nor discomfort of any kind in or about the ear since the operation. The meatus looks normal and the membrana tympani nearly so. The post-aural surface is smooth with a linear cicatrix. The mastoid process has been and is nearly the counterpart of its fellow.

PAPER:

CASE OF CHRONIC SUPPURATIVE ETHMOIDITIS, SARCOMA OF RIGHT TEMPORO-SPHENOIDAL LOBE, WITH MISLEADING SYMPTOMS—OPERATION—DEATH—AUTOPSY.

J. A. Stucky, M. D.

The following case, on account of the extensive and serious pathologic condition, involving vital structures, and the very confusing and misleading symptoms, is considered of sufficient interest to bring before this society for discussion:

On December 7, 1905, Mr. J. J. H., aet. 51, was brought to me by Dr. E. V. Seay, of Salvisa, Ky., with the following history: Had been troubled for many years with nasal catarrh; at times large quantities of pus would discharge from nose which would be followed by great relief for some days or weeks. Had a prolonged attack of malarial fever six months ago. Two weeks ago he began suffering excruciating pains in frontal region between the eyes, pain being aggravated by jarring the bed, or when in a stooping position. Suffered greatly from nausea, mental depression and insomnia.

His gait was unsteady, inclining to the right as he walked across the room. Skin was of muddy, septic appearance; right eye protruding and moved sluggishly. Very slight pressure or tapping over frontal sinus or at inner canthus gave rise to acute pain. Right nares filled with mass of bluish red granulations, through which pus exuded. There was no evidence of the middle turbinate. Left nares much congested, but othewise normal. Transillumination of the maxillary and frontal sinus was positive on right side. Ophthalmoscopic examination showed nothing abnormal in the fundus. The pulse was slow and full; articulation difficult

and mind sluggish. Insisted that nothing was wrong but right side of his head. Tongue was heavily coated and breath foul. Blood count showed leucocytosis of 19,000.

He was sent to the hospital and Drs. G. P. Sprague, F. H. Clarke and J. Estell saw him in consultation. All agreed upon diagnosis of chronic suppurative sinusitis, with probable meningeal involvement of right temporofrontal base in purulent inflammation. The apparent aphasia, at that time, was thought to be due to stupor.

The urine was scant, loaded with indican and contained some albumen. A large dose of calomel and salol was given, followed by castor oil oz. i and salts oz. ss, in six and eight hours alternately.

He had a good night's sleep, after taking 15 grs. each of salicylate and bromide of strontium. Was purged freely. Nasal irrigation followed by application of adrenaline solution gave some relief to pain, and breakfast was eaten with apparent relish. Two hours after eating complains of increased pain, yawns and gapes constantly while awake. There is distinct aphasia (he is right-handed) with very frequent slight convulsions of the right hand and arm, and tongue deviates to the right. Constant pain is referred entirely to the right fronto-orbital region. A brain tumor of the left side was thought probable by one of the consultants. Late in the afternoon of December 8th, symptoms of brain pressure—deep stupor, more bulging of the right eye, came on, and after consultation it was decided to operate at once.

Patient was etherized without difficulty or excitement; pulse and respiration being improved by the anesthetic. I made the usual incision for entering the frontal sinus after Killian's method. The sinus was found free from granulations or pus, but the lining membrane was greatly thickened and congested and of a very dark bluish color. The naso-frontal duct was completely blocked by firm granulations, which when removed showed a completely degenerated ethmoid—having the appearance of polypoid degeneration so frequently seen. The whole of this was removed with curette and forceps. The maxillary sinus was found to be blocked by firm tissue, which I supposed to be polypi and granulations. To facilitate the removal of this the sinus was entered through the canine fossa, and very offensive pus and firm granular tissue removed which had the appearance of sarcoma. The

nasal wall and floor of the orbit was involved in the process of necrosis. After completely cleaning out as far as possible all pathologic tissue and thoroughly cleaning the parts, the usual gauze packing and dressing was applied and patient put to bed in good condition. Duration of operation, one hour and twenty minutes. One hour after operation patient was conscious, with normal temperature and pulse.

At 8 a. m. the following morning—ten and half hours after the operation—pulse and temperature normal, mind clear, no pain, no hesitancy in speech. Patient censured me for not operating upon him sooner. Was thirsty and hungry, and there being no nausea, a cup of coffee and a slice of toast was given, which he ate with a relish. These symptoms continued until 9:45 p. m. (twenty-four hours after the operation), when alternate stupor and restlessness came on, followed by yawning and grinding of teeth, and extreme restlessness. This condition increased until his death, thirty-one hours after the operation. There was no return of intense pain, and no complete loss of consciousness, notwithstanding the deep stupor, until a few moments before his death, which came without a tremor.

Four hours after death the autopsy was held by Dr. Julian Estell, in presence of Dr. Sprague and myself, and the report of the latter from a neurologic, and the former from a pathologic, standpoint is given:

"January 13, 1906.

"Dear Dr. Stucky:

At your request, I saw Mr. Head at the Good Samaritan Hospital, December 8th, at 11:30 a. m. At that time he was very feeble, skin sallow, mouth and eyes dry and tongue covered with dense, dry brown coat. His pulse was 55 and respiration 15. The pupils were equal, moderately contracted and reacted slowly to light and accommodation. Because of his weak condition, his other reflexes were not tested. His mind was very sluggish, and he would lapse into unconsciousness while answering questions, but he complained of very severe pain under right eye, and of severe but vaguely outlined pain over right frontal region. He insisted that he had no pain elsewhere, but was too nearly stuporous to discuss his condition further. There were no focal symptoms, although a slurred articulation and the occasional loss of a word suggested aphasia more than stupor. He was operated

upon that night, and I saw him again at noon, December 9th, at which time he was rather less dull than before the operation, but gave such irrelevant answers to questions that no statements could be gotten from him. His tongue, at that time, deviated to the right, and the right hand and arm were slightly convulsed every minute or less. He located the pain as before, but said it was less severe. His articulation was more impaired, and the aphasia, deviation of the tongue and tremor of the right arm suggested disease in the third frontal and anterior central convolutions of the left side. At autopsy, four hours after his death, December 11th, part of the third frontal convolution and the power part of the anterior central convolution of the right side were discolored from light red to nearly black from hemorrhages. A small part of the region mentioned appeared normal, but most of it was more dense than normal. Upon section, it gave the impression of being fibrous. The ventricular fluid was slightly in excess of normal, and of a clear, blood-tinged color. There was no involvement posterior to or below the fissures, and no disease as far as could be determined by naked eye examination in any other part of the brain. His son stated that he was right-handed. Very truly yours,

(Signed) Geo. P. Sprague."

"Autopsy—Mr. Head, December 11, 1905.

Skull cap removed. Right temporo-sphenoidal lobe of brain adherent to floor of middle fossa. Slight adhesions along vertex of longitudinal fissure, extending about two inches in front and behind fissure of Rolando and down about one inch over cortex. Whole of right temporo-sphenoidal lobe of a red grey mottled color and meninges adherent over base of the lobe.

On section the lobe seemed entirely replaced by an encapsulated mottled red and gray mass of semisolid, pasty consistency. Closer inspection showed trabeculae of firmer fibrous-like bands running through the mass with soft, pasty, dark red grumous material in the spaces, giving an alveolar structure to the mass. The tumor gave the gross appearance of an "infected sarcoma." Tumor was examined microscopically and proved to be sarcoma, both small round and small spindle cells being found. The whole tumor being far advanced in process of degeneration, showing evidence both

of inflammatory infiltration and necrosis, the indication being that infection had extended from the nasal accessory sinuses. JULIAN ESTELL, M. D."

I have reported this case as briefly as possible without omitting important detail, although every hour the patient was under my care was filled with more or less interesting and peculiar symptoms. From the time I saw him until within four hours of his death, the temperature, pulse and respiration, which were recorded every three hours, varied from 96° to 98° F., pulse 56 to 68, respiration 15 to 19. Four hours before he died the temperature rose to 103°, respiration 21, pulse 120.

Some of the most interesting points to me, and those selected for discussion, are (1) relation of cause and effect—was the cerebral condition the result of the sinus condition or vice versa? (2) The confusing and misleading symptoms indicating pressure in left side of brain. (3) Could general intracranial pressure exist without ever producing motor symptoms referable to right-sided pressure? (4) What would have been the probable result if the sinus disease had been eradicated months before?

DISCUSSION.

Dr. J. F. McCaw said that he quite agreed with Dr. Jackson when he spoke of the tendency of chronic purulent discharge from the nasal sinuses to produce malignant conditions. Although this has not yet been proven, he had a strong belief that this took place in several of his cases, one specially, which gave a history of chronic purulent nasal discharge extending over twenty years. He removed from the left nostril several large polypoid masses which promptly recurred. After several of these recurrences, he advised and did a radical operation through the anterior antral wall, cleaning out the maxillary antrum, ethmoid cells and sphenoid of what proved to be a sarcoma. The patient rallied from this, but died several months later from extension. There is ample clinical evidence to show the relation between constant irritation and malignant development. In Dr. Stucky's case, he would, therefore, be inclined to the opinion that the suppurative sinusitis preceded and stood in direct relation to the sarcomatous development.

Dr. T. H. Chambers recited the case of a woman, 56 years of age, suffering with an epithelioma of the skin of the region of the lachrymal canal. The skin lesion had been several times cauterized and excised. Little heed, if any, had been taken of the interior of the nose. On coming under Dr. Chambers' care, he found a fetid rhinitis with crusts, scabs, necrosis and suppuration. The septum was entirely gone and it was necessary to curette into the sphenoidal sinus, high up in the ethmoid region and well into each maxillary antrum, before healthy surface was reached. There was a small opening connecting this fetid mass with the epithelioma on the surface of the skin. Hence, Dr. Stucky's contention was right—that malignant disease might be caused by suppurating disease of the sinuses.

Dr. Chevalier Jackson said that with his usual clear perception, Dr. Stucky had propounded four queries.

First.—Was the cerebral condition the result or the cause of the sinus condition?

While it is not known what the sarcomatous condition is, and still less what the presarcomatous condition may be, yet he thought the surgeon of today recognized that, clinically, any chronic irritation or inflammatory process predisposed if not to malignant diseases at least to the determination of its site. In this case, the history of many years' "catarrh" points to the sinus condition antedating not only the brain condition, but also the malignancy. He would regard it as probable that the sinus trouble was a factor, at least, determining the site of the sarcoma and that the cerebral condition was secondary to the sinus trouble.

Second.—As to the confusing and misleading symptoms indicating pressure on the left side of the brain. The aphasia with a right-sided lesion in a right-handed man, might be explained on the hypothesis of an anomaly, or of some previous lesion of the speech center or the association tracts, by reason of which the right side of the brain had taken on the functions of the damaged portions of the left side. The heteronymous paretic symptoms could scarcely have been due to general intracranial pressure, as this would certainly have produced some bilateral pressure symptoms.

Furthermore, the pressure was intermittent while the paralysis was constant. General pressure could, however, have caused the pandiculation by affecting the oblongata.

Third.—As to the justifiability of the operation, there could be no question. No one could expect to know as much before the post-mortem as after it, and in nothing is this so true as in brain disease. The death was evidently due to the operation. There had been exacerbations, and it was probably during one of these that the patient died.

Fourth.—Speculation as to the outcome of treatment of the sinus condition years previously is interesting. If Dr. Stucky had seen this case before sarcoma developed, he could not help feeling he would have cured the sinus disease and the patient would never have had sarcoma, at least not in that location. The pathologists would not agree with this, which was a clinician's view.

Everything in the clinical history of this case impressed the speaker with syphilitic possibilities, either as an active lesion, a preceding lesion upsetting the nerve paths, or as a predisposing factor in the sarcoma.

Had this been his case, he would have opened the brain—uselessly and on the wrong side.

Dr. S. F. Snow said that Dr. Stucky's description of this case had been extremely interesting, but he was glad to say he had met with no case of sarcoma in this region, though, together with all nose and throat operators, he had treated a large number of cases of suppurative ethmoiditis. Sometimes he had thought that they were unusually numerous in this section of the country, and it was with much satisfaction he noted the benefit of clearing out the nasal passages of all obstructive accumulations. He had been very much interested in observing what a large percentage of these cases presenting chronic suppurative states, tolerate full doses of potassium iodid. For the past five years he had almost invariably tested these cases with this drug, and it was quite the rule to find they could take from 30 to 90 drops t. i. d. for several months with impunity.

He did not consider it necessary to establish a definite, specific history, for the cases he had followed up had proved to be from an inherited infection, and it was usually waste of effort to trace the disease to its source.

PAPER:

THE TREATMENT OF CHRONIC MAXILLARY SINUSITIS.

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The treatment of a maxillary sinusitis will, of course, depend to a certain extent upon the cause, and, for this reason, all pathologic processes about the roots of the teeth must be carefully looked into and when present be removed.

Diseased roots, however, are not frequent etiologic factors, as by far the larger number of cases of antral disease are secondary to pathologic conditions in the nose.

Treatment of Acute Maxillary Sinusitis.—In the majority of the cases of acute inflammation of the antral mucous membrane, a policy of conservative noninterference is best. By this I do not wish to be understood that nothing should be done, but that not *too* much should be done at first. We are probably all agreed on this point. Proper treatment of the nasal condition will in the majority of the cases be all that is necessary. When this mucous membrane is much congested, particularly in the middle meatus, the use of equal parts of a weak cocain and adrenalin solution is extremely useful.

I am in the habit of saturating pledgets of cotton with this solution, allowing it to remain in the nose for a time. As there is usually a certain amount of pus in the nostrils, and as acute maxillary sinusitis so commonly complicates influenza, when the nasal mucous membrane is very much congested any way, the use of sprays, particularly coarse sprays, is not without the danger of carrying infection to the middle ear. A very fine spray of a 1-20,000 or 1-30,000 adrenalin, with a little cocain, may be used after the acute symptoms have partially subsided, but during the acute stage, the cotton pledgets are safer.

I wish to take this opportunity to say a word against the use of the ordinary nasal douche by the patients themselves,

in the treatment of acute conditions of the sinuses. In a patient's hands, this is sometimes a dangerous thing to use. The writer has had two severe cases of otitis media resulting from the use of the douche, the patients, in both cases, having received the douche from a general practitioner. During an acute sinusitis, the nasal mucosa is usually very much inflamed, and with the presence of pus, an infection can, as before stated, be readily conveyed to the middle ear by way of the Eustachian tube. If it is necessary to wash out the nose, it should be done by the attending physician, and not by the patient.

Inhalations from a steam atomizer or croup kettle, and hot external applications to the antral region, are very useful. I am in the habit of using a mixture of compound tincture of benzoin, oil of turpentine and tincture of hyoscyamus in a steam atomizer, or croup kettle, and having it inhaled through the nose. If free drainage and some relief from pain should not be obtained by these measures in forty-eight hours, paracentesis may have to be resorted to, particularly if the tension symptoms are great.

Puncturing the antrum through the inferior meatus where the nasoantral wall is thinnest, usually about an inch back, is a simple procedure, but should be performed with strict asepsis. A sterile, warm, saline solution answers very well for irrigating the antrum. In some acute cases, a single irrigation will suffice; in others, if the discharge from the antrum persists, it may have to be done a number of times. In such cases, a temporary opening through the inferior meatus, at the lowest possible point, in order to obtain good drainage, may have to be made. The antrum can then be easily washed out.

We read much about washing out the antrum through the natural opening. Now, while this can be done in cases of chronic empyema, I must confess that when the nasal mucosa is much congested, except in exceptional cases, I believe it is not at all as easily accomplished in acute cases, as we are often led to believe. An oil spray of menthol and albolene, or menthol, albolene and hydrocarbolene, to which is added a small amount of cocain or adrenalin, is very useful while the nasal mucosa is much congested.

Perhaps something should be said concerning the constitutional treatment of acute maxillary sinusitis. In the beginning of an attack, calomel followed by a saline, and

drop doses of aconite, repeated until the patient perspires freely, are useful in relieving the congestion of the mucous membrane. I do not believe that the coal tar products are of much service in controlling the pain, although occasionally 5 gr. doses of phenacetin, or migraine tablets, repeated as often as necessary, will afford some relief. It is always wise to stimulate patients somewhat while giving coal tar products, because symptoms of cardiac depression have been known to develop after comparatively small doses of such drugs, particularly acetanilid. Morphine should not be used, because, just as in acute frontal sinusitis, or mastoiditis, it masks the symptoms to such an extent at times, that well marked tension symptoms might be overlooked.

In connection with the question of irrigating the maxillary antrum, it is interesting to determine whether it is possible, as stated by Lermoyez (*Annales de Maladies de l'oreille du Larynx, du Nez,* etc., November, 1902). for the frontal sinus to become infected by carrying some infected material into the sinus during irrigations of the antrum of Highmore, either by way of the hiatus semilunaris, or even more directly, when a direct communication exists between the frontal sinus and antrum. Menzel (*Archiv. für Laryngologie und Rhinologie,* Bd. XVII, Heft III, 1905) has shown by his experiments on cadavers, that this is not possible.

His conclusions are briefly as follows: The irrigating fluid, injected through an opening into the antrum of Highmore, only reached the frontal sinus, when an external opening had also been made into the sinus. In all the trials made in which no external opening had been made into the frontal sinus, there was not a single case in which any of the irrigating fluid, even when forcibly injected into the antrum, reached the frontal sinus.

The sinus, being filled with air, will not allow the entrance of any of the irrigating fluid. In cases, on the other hand, in which an external opening had been made into the frontal sinus, the irrigating fluid could be readily forced from the antrum into the sinus.

These investigations of Menzel would seem to be rather conclusive, as showing that the frontal sinus cannot be readily infected during irrigations of the antrum.

It is of particular importance in the acute cases to correct any nasal condition interfering with proper drainage from the antrum.

To come now to the treatment of chronic maxillary sinusitis, which as a rule is a chronic empyema, I do not think that any methods of treatment, except the operative ones, need be considered.

Considering first the operation through the nasoantral wall, it may be said, that while this method is very successful in selected cases, in the writer's experience at least, it is not always followed by the best results. The writer has operated on a few cases of chronic antral empyema by this method, and in all but one case, the results were not good, the discharge did *not* entirely cease, and in two cases the radical operation through the canine fossa had to be performed eventually. In each case, a large opening had been made through the internal wall after resecting a little more than the anterior portion of the inferior turbinate, and the degenerated antral membrane and granulations were removed as thoroughly as possible through the nasal opening.

Perhaps the writer's technic was faulty in some way, or perhaps the opening through the nasoantral wall was not large enough. This method has many strong advocates, however, such as G. L. Richards, Freer, Rethi, Curtis, Myles and others. It is, perhaps, true, as stated by Freer (The antrum of Highmore: The removal of the greater part of its inner wall through the nostril for empyema. *The Laryngoscope,* May, 1905), that many of the operations through the nasoantral wall are not successful, because not enough of the internal wall is removed.

Rethi (*Wiener Klinische Wochenschrift,* No. 34, 1904) recommends the removal of the anterior two-thirds of the inferior turbinate, and an extensive resection of the nasal wall of the antrum both in the inferior and middle meatuses.

Claoué (*Semaine Medicale,* October 15, 1902) makes a large window through the inferior meatus.

H. H. Curtis (*The Laryngoscope,* October, 1903) reports an operation in which, after the anterior third of the inferior turbinate is resected, an opening is made through the lower part of the inner antral wall with a trephine and enlarged with a burr. Case reports were not given in this paper.

Richards (*Journal of the American Medical Association* September 16, 1905) reports good results with this method, because he states "that in many cases the antral mucous membrane is not particularly degenerated." A permanent opening is usually established through the nasoantral wall only

in the chronic cases, and in the majority of these the membrane is not only degenerated but greatly thickened.

Coakley's investigations prove this conclusively. (Observations Upon the Pathology of Chronic Suppurative Inflammations of the Antrum of Highmore, Trans. Amer. Laryn. Asso., 1902.)

The pathologic changes in the cases examined by him showed great thickening of the mucous membrane in every case. This he found was due to an increase in the loose connective tissue layer beneath the epithelium.

I do not think that the operation through the nasoantral wall will turn out to be *permanently* successful in every chronic case where this thickening and degeneration of the antral mucous membrane exists.

Richards also states, however, "that if the condition does not improve after a reasonable length of time with this method, any nasal operation alone will not be sufficient, and nothing less than the radical operation through the canine fossa will bring about a cure." The rule in all operative work upon the maxillary sinus, just as in the case of the frontal sinus, should be to perform the operation that will be followed by *obliteration* of the sinus. Such an operation, too, should be performed, that every part of the sinus can be directly inspected. This is not easy in operations through the nose. We all know how difficult it is to maintain an opening through the nasoantral wall, even when a large opening is made. Granulations will develop, and the opening will become small in a short time. In selected cases, however, this operation is undoubtedly sometimes followed by excellent results, for which we have the testimony of the careful observers mentioned.

Where no ethmoid disease exists, and where the nostril does not contain numerous polypi, this operation may be tried first. When multiple polypi (a common symptom of chronic sinusitis) exist in the nose, in conjunction with a chronic purulent discharge from the antrum, the antral mucous membrane will be found greatly thickened and degenerated in *every* case; in fact, in many cases the antrum itself will be found filled with polypi and granulations.

In such cases, where we have almost a positive assurance that the antrum will be found greatly diseased, it seems a better plan to perform the radical operation in the first place, rather than to establish an opening through the nasoantral

wall, and then later, perhaps being compelled to perform the radical operation anyway.

Nothing but the radical operation, the Caldwell-Luc, or some modification, and the *complete* removal of the antral mucous membrane will result in a cure in many such cases.

I will not describe the technic of the radical operation, as it is so familiar to everyone. Just as much of the anterior wall as possible should be removed and all of the mucous membrane.

The writer has found the Luc forceps very useful for rapidly removing polypi and granulations from the antral cavity.

It is almost impossible to remove all of the degenerated membrane by any except the radical operation. The Coakley lamps that are so useful in frontal sinus work, are of the greatest service for inspecting the antrum while operating. In cases in which a direct communication exists between the frontal sinus and maxillary antrum, if a frontal sinus empyema exists, the frontal sinus would first have to be operated upon, before the antral disease could be cured.

There is no *positive* assurance, in cases where the operation through the nasoantral wall has been performed, and the opening is finally allowed to close, that the sinus may not again become infected, particularly during influenza epidemics.

In conclusion, the writer would briefly report the two following, rather unusual, cases of chronic antral disease:

Mr. J. L., merchant, aged 45 years, has been under the writer's care for several years, for recurring nasal polypi. During the past four years, polyi have been frequently removed from the left nostril. Antral disease was diagnosed when he first came under observation, but he was always satisfied with the relief obtained after the removal of the polypi, and persistently refused any other operative work. During the past year the discharge of pus was so profuse, the polypi recurring about every two months, and he suffered so much from pain in the left half of the head and in the eye, that he consented to the radical operation. This was performed in the usual way, and the left antrum, which was very large, was found filled with pus, and a mass of apparent polypi and soft granulations. There was very free bleeding when these were cleared out with Luc's forceps. The mucous membrane, which was greatly degenerated and thickened, was removed with curettes. It is now a number of months since

the operation has been performed, and there is no discharge from the nose, the left nostril being entirely clean. The histological examination of the mass removed from the antrum is interesting. It is as follows:

"Bender Hygienic Laboratory,
Albany, N. Y.

The specimen removed from the antrum shows a very rapidly growing papillary polyp with infection, degeneration and necrosis. There is no definite evidence of malignancy, but from the general appearance of the tumor, I would advise careful watch for recurrence.

Very truly yours,
R. M. Pearce,
Director."

This examination explains the rapid recurrence in the nostril after each removal of the growths. The histological examination is also of interest, because it shows perhaps the first stage in the change of a benign to a malignant growth. The earlier examinations of the growths removed from the nose, in this case, showed that they were the ordinary polypi. The last examination of the growths removed from the nose also showed, however, a beginning change in the histological structure.

The second case is that of a young woman, aged 36 years. She has had a purulent discharge from the right nostril for years. Transillumination showed a shadow under the right eye, and a dark pupil. On examination, numerous polypi were found in the middle meatus of the right nostril. The anterior ends of both inferior and middle turbinates were much enlarged and edematous.

She would not consent to the radical operation, so that after removing the polypi, the anterior end of the middle turbinate, and a little more than the anterior third of the inferior turbinate, an opening was made through the inferior meatus. The antrum was filled with soft granulations, and there was a free discharge of pus. The patient's general condition was so poor, that the pus from the antrum was subjected to a microscopic examination. It was found to contain tubercle bacilli. None were found in the sputum, however, nor could any general tuberculosis be discovered. Coakley, in the paper before mentioned, reports the case of a young man, aged 26 years, with double antral disease. Microscopic examination of the

scrapings from the left antrum, showed the presence of giant cells and a few tubercle bacilli. Sputum examinations in this case were also negative.

Before closing this paper, the writer would like to say a word about the use of "somno forme" in operations upon the upper air passages.

It is an admirable and safe anesthetic, and can be used to great advantage as a preliminary step in the administration of ether. It is used in a special "somno forme" inhaler. It is composed of chlorid of ethyl 60 per cent, chlorid of methyl 35 per cent and bromid of ethyl 5 per cent. The patient is completely under the influence of somno forme in thirty or forty seconds, and then the administration of ether can be started at once. It does not produce cyanosis, as is the case with the ordinary nitrous oxide gas. It certainly shortens the administration of a general anesthetic very much.

DISCUSSION.

Dr. John O. Roe thought that very few could disagree with Dr. Theisen in the general plan laid down by him for the treatment of these cases. There are, however, two or three rather important points which he would mention that he had not time to touch upon in his paper.

In connection with the use of the douche, especial mention had been made of the danger of forcing the fluid into the middle ear. This danger could be averted by instructing the patient to open his mouth and keep it widely open while using the douche or while syringing the nose for any purpose. Fluids are liable to enter the middle ear only during the act of swallowing, which opens the Eustachian tube, and swallowing is well nigh impossible with the mouth wide open.

In the treatment of diseased conditions of the posterior ethmoid cells, it is important, after opening or curetting them that they be properly and thoroughly irrigated. This can best be done by using a syringe having a long slender tip, which should be carried well back into this region. The danger of forcing septic material into other cells on cleansing the parts is slight compared with that from allowing material to accumulate here and force itself into the adjacent cavities.

There is one question which should be taken into consideration in deciding whether to select the nasal or the canine

fossa route for entering the maxillary sinus. This has to do with the relative position of the floor of the nasal passages to that of the floor of the maxillary sinus. In many cases the floor of the maxillary sinus lies above the plane of the floor of the nasal passage, while in others it extends down far below this plane. This condition can be determined by making a small opening through the nasoantral wall and exploring the cavity with a blunt-pointed, slender silver probe. In the former case a free opening from the nose provides a free dainage from the antrum into the nasal passage, while in the latter class of cases, an opening from the nose into the antrum would provide drainage from the nose into the antrum, instead of out of it, and, therefore, would serve as a cul de sac for the reception of nasal secretions and discharges. In these latter cases, an opening through the floor of the sinus or from the canine fossa is necessary, in order to provide proper drainage. In some of these cases, in which the disease of the antrum is sufficiently extensive, the Caldwell-Luc operation, an opening from both directions, may be advisable or necessary to give a better and quicker result than by either opening alone.

Regarding the performance of the radical operation in all cases of sinusitis, he could not agree with those who favor this plan. The tendency in nearly all cases of antrum diseases is toward recovery, and those cases in which there is simply a catarrhal condition of the mucous lining of the cavity unattended with polypoid growth or other forms of degeneration, will by appropriate mild medication, together with complete drainage, in nearly all cases, get well. In order, however, to secure free drainage, it is necessary in all cases to make a large, free opening, whether through the nasoantral wall or the canine fossa, sufficient for thorough exploration and proper treatment. In those cases, however, in which there is sufficient degeneration of the mucous membrane or foreign growths or other diseased conditions, the radical operation, even to the entire eradication of the mucous membrane and the removal of the external wall, so as to obliterate the cavity, as advocated by Jansen and Killian, is often demanded.

Dr. George B. Wood said that he would like to make a plea for more conservative measures in the treatment of diseases of the maxillary sinus. That many cases of antral disease get well without treatment of any kind is an assured

fact. A fairly large proportion of the cases which he had seen, heal when proper drainage has been established, such as is produced by the insertion of a silver tube into the antrum through the inferior meatus. He was sorry to take issue with Dr. Theisen concerning the etiologic importance of tooth infection. At least one-half of the cases, which he had treated, were undoubtedly due to infection through the roots of molar teeth, as was demonstrated by the finding of carious roots connected by fistula directly with the antrum.

PAPER:

THE PHYSIOLOGY OF LANGUAGE AND ITS RELATION TO THE TREATMENT OF STAMMERING.

G. Hudson Makuen, M. D.

The subject of defects of speech is one that has been almost entirely neglected both by regular teachers and regular practitioners of medicine, and it has been relegated for the most part to irregulars and quacks, who have not failed to reap from it an abundant financial harvest. The nervous type of individual usually afflicted with defective speech is an easy prey for charlatanry and a fit subject for the most serious study and scientific treatment. Speech is so largely a product of the organs of the so-called respiratory tract, that a study of its defects, it seems to me, properly belongs to the laryngologist. Of course, there is an important neurologic element which must also be taken into consideration, but this requires scarcely more knowledge of the nervous system than the average physician should possess, except perhaps in the acquired forms of defective speech coming under the head of aphasia.

The nomenclature of defects of speech is in great need of revision. The words stammering and stuttering, for instance, have been variously used by different authors. The Germans use stuttering to designate the spasmodic defect of speech, to which we give the term stammering, and they confine the term stammering to the simple substitution of incorrect sounds for the correct ones. An argument in favor of this use of the term is the fact that nearly all countries have the equivalents of these words, showing the necessity to distinguish between the two forms of defective speech. However, as English speaking authors usually apply the word stammering to the spasmodic affection of speech, I have thought it best to conform to this custom and to ignore the word stuttering or to use it to designate the initial stage and milder

forms of the severer affection. I would define stammering, therefore, as a more or less constant inability to speak freely, owing to an incoordinate and spasmodic action of the respiratory, phonatory or articulatory muscles.

In the consideration of this subject it is well to keep in mind the fact that the muscles employed in the production of speech are not entirely within the control of the will. Indeed, their precise coordinate action is involuntary. The most fluent speaker stammers occasionally, but he happens to be able to recover himself immediately and without attracting his own or others' attention. If he should fail to be able to recover himself a few times, he would become, as we say, nervous about it and lose confidence in his ability to speak with freedom. This is the way that stammerers are made, and they tell us that only those who have passed through the ordeal can have any adequate conception of the embarrassment and mental anguish that accompany it. There are probably few diseases of a similar type that entail more physical inconvenience or mental suffering.

The affection is also a prevalent one. It has been estimated that nearly 1 per cent of all school children stammer. It is common to people of all nationalities, but more prevalent among those whose language is rendered somewhat harsh by the predominance of consonant sounds, and less prevalent among those whose language abounds in vowel sounds. While the affection belongs chiefly to childhood, there are many cases in whom it continues into adult life and even into old age, but we do not see, or hear of them because, being handicapped in the race, they are leading more or less secluded lives, and many die early because, having a weak nervous organization to begin with, they are unable to endure the strain that is placed upon them. Stammering is a serious obstacle to progress in all social and intellectual pursuits. Only the most menial positions are open to its adult subjects, and school children, unable to keep up with their studies, drop back into lower grades, neglected and discouraged.

In consideration of this subject, some distinction should be made between speech and language. Language may be defined as a series of symbols agreed upon by a people for the expression of thought. The symbols of a language may be oral, graphic or pantomimic. Speech is the oral expression of thought through the medium of the recognized symbols of

language. The English alphabet has 26 graphic symbols or characters called letters. The names of these symbols or letters do not, as a rule, correspond with their sounds when spoken or read. The name of the leter a, for instance, corresponds with only one of its five sounds. The name of the letter b contains two physiologic sounds, b and e. W contains six physiologic sounds, d u b l e oo. In order, therefore, to study spoken language as we study written language, it is necessary to construct an alphabet of sounds which shall bear the same relation to speech that the English alphabet of letters bears to writing. This was done as early as 1827 by Dr. Neil Arnott and later by Wyllie, Melville Bell, Pittman and others. Receiving the suggestion from these authors, I have made a table of sounds which I have endeavored to bring up to recent standards and to which, after the manner of Wyllie, I have given the name of The Physiologic Alphabet.

I have made some copies of the alphabet which I shall now distribute in the hope that you may the more easily understand my explanation of it, and also the application of it to the treatment of the different forms of stammering.

Explanation of Physiologic Alphabet.

The use of this alphabet, as I have described it to you, constitutes the basis for the phonatory and articulatory treatment of stammering, and, I may say, also, of all the other forms of defective speech. The patient is taught to speak in exactly the same way in which he was originally taught to read, the alphabet of sounds being used for the teaching of speaking as the alphabet of letters or symbols was used in the teaching of reading. You will observe that each of these two processes has a mental as well as a physical developmental feature connected with it. In fact, the mental developmental feature predominates, for the mental faculties guide and control the musculature of both reading (aloud) and speaking. The use of the alphabet, therefore, in the treatment of stammering serves as a mental as well as a physical discipline, and teaches the art of orderly thinking as well as that of orderly speaking. A further analogy between the teaching of speaking and the teaching of reading may be pointed out. Just as a child learns to read one short word or syllable at a time, so we teach the stammerer to phonate and articulate one short word or syllable at a time, and we call this, after the manner of Melville

Phy si o lo gic Al pha bet.

Con so nants.

	Voiceless oral	Voiced oral	Voiced nasal	*
Labials	P. Wh.	B. W.	M.	Paul Brown made white wax.
Labio-dentals	F.	V.		Full voice.
Linguo-dentals	Th'	Th''		Think thou.
Anterior Linguo-palatals	S. Sh. T.	Z. Zh. D. L. R.	N	Some zealous. sheep leisurely took down nine large rails.
Posterior Linguo-palatals	K. H.	G. Y.	Ng.	Can girls bring home yeast.

VOWELS.

E.	A.	Ah.	Aw.	O.	OO.
Even	apes	are	awed	over	oozing.

ā	ă	ä	a	ȧ	ē	ĕ
Aim	at	alms	all	ask	even	elk

ō	ŏ	o͞o	o͝o	ĭ	ŭ
old	oxen	whose	look	is	up.

COALESCENTS.

ar̄	ar̆	er̄	er̆	or̄	or̆	o͞or	ŭr
Airs	are	here	sir.	More	for	poor	Burr.

*Sentences, the words of which begin with the physiologic sounds.

Bell, syllabication. He has well said that syllabication is the cure for all oratorical and speech defects. In a sense, all speech is syllabic, but in the beginning of the treatment for a marked defect of speech like stammering, the syllables should be pronounced at first each for its own sake to the point of almost entirely ignoring the meaning of what is being spoken or read. In fact, it is well to take words and sentences having but little thought or literary significance. The physiologic elements contained in the alphabet and the words and sentences used as a key to their order, furnish illustrations of good examples for practice, and sentences may be used in which there is a contrast in the meaning of the words, as, "Bring me some ice," not "some mice." I said "a knap sack strap," not "a knap sack's strap."

During this procedure, which should cover several weeks, the patient is encouraged to refrain from ordinary conversation, to give his entire time to the prescribed practice and to speak only in the prescribed syllabic manner, using words and sentences that should be especially given to him to serve as a means of expressing his feelings and desires.

Melville Bell has also called attention to the physiologic division of words into syllables for the purpose of syllabication. They should be divided, not according to their etymology, as you find them in the dictionaries, but according to their physiologic enunciation. For instance, we say phy-si-o-lo-gic, not phys-i-o-log-ic, and e-ty-mo-lo-gic,, not et-y-mol-o-gic. This is the natural or easy way to pronounce words, and we take advantage of the fact not only by calling the attention of the stammerer to it, but by practicing him in the art of doing it. We also teach him syllabication by having him read the elements of language as they appear in sentences. This is called phonetic reading.

Oscar Guttman devised or suggested a method of diagramming sentences for syllabic reading as a help in the treatment of stammering and other defects of speech.

In this syllabic reading and speaking, it will be observed that each syllable requires a separate and distinct respiratory impulse, and the patient is taught exactly how to give this impulse. He is shown that it originates in the region of the large waist muscles, and that the diaphragm is the centre of the group of muscles employed.

It has been asked whether this method may not develop a

formal and stilted style of speaking, and my answer is emphatically no, because as soon as the Physiologic Alphabet is mastered and a sufficient amount of practice in the purely syllabic form of speech has been used, the syllables should be put together in their natural manner and smooth, rhythmical speech should be practiced for a long time.

DISCUSSION:

Dr. G. Hudson Makuen, in closing, said: In reply to Dr. Smith's remarks relative to the possibility of establishing a method of speaking which shall be only a little less faulty than the one that we are endeavoring to supplant, I would say that there is not the slightest danger of any such occurrence. There must be a period in the treatment of stammering during which the patient should not be on exhibition, and during which he should converse only with those having charge of his training. He must give up the old methods and become familiar with the new, and, just as a child must creep before it can walk, so the stammerer must learn to talk in short words and syllables before he can speak connectedly in sentences. The stammerer who has been properly trained in this manner not only does not stammer, but he speaks more naturally and effectively than one not having gone through the trying experience of stammering. It is another instance in which a weakness may be turned into an element of strength.

PAPER:

A CONTRIBUTION TO THE TECHNIC OF THE SUBMUCOUS SEPTAL OPERATION.

JOHN MCCOY, M. D.

The evolution of every surgical procedure is marked by contributions from time to time, of suggestions from those who have practiced it. In these contributions, the stronger points of the procedure are reiterated and thereby receive emphasis and endorsement, while for the weaker ones new suggestions are offered, which in the light of time and experience are either adopted or discarded. This in brief has been the history of the submucous operation for the correction of deviations of the nasal septum. A new incision has been added here and a new instrument suggested there, and so by a gradual process of inclusion and exclusion, gleaned from experience, we aim to secure simpler methods and better results. The comparatively recent adoption of this operation renders it still a fruitful subject for discussion. With this in mind, I venture to offer for your consideration the following thoughts and suggestions which have come to me while operating on a series of one hundred and twenty cases. For the purpose of convenient consideration, the operation itself may be divided into five essential steps; these are:

(1) The primary incision.

(2) The elevation of the mucous membrane, perichondrium and periosteum of the convex side.

(3) The incision of the cartilage.....to effect.

(4) The elevation of the mucoperichondrium and periosteum of the concave side.

(5) The removal of the deviated cartilage and bone.

In the experience of the writer, the single incision, either vertical or oblique, meets all requirements, and for the following reasons has been adopted in all cases: It gives the least amount of possible hemorrhage, both during and after the

operation healing is accomplished much sooner after the operation, and with the use of appropriate instruments we can obtain a clear view of and an easy access to the field of operation, even back to the posterior limit of the septum. When the anterior portion of the triangular cartilage is dislocated into the vestibule, we must of necessity make this incision obliquely along the anterior edge of the cartilage. When the septum is deviated into the vestibule, forming a sharp vertical angle, the writer has found it best to make the incision immediately over the angle. In all other forms of deviation the incision is made just in front of the deviation on the convex side. It is carried from the floor of the nose well above the upper limit of the deviation. It cannot be too well emphasized that this incision should be carried a slight distance into the cartilage itself, as this greatly facilitates the commencement of the second step, and insures the operator against trying to elevate mucous membrane without getting under the real perichondrium, a mistake which is frequently made by beginners. For making the primary incision, the writer uses a knife (Fig. 1) which he has devised for the double purpose of making this incision as well as the later incision through the cartilage. It has a movable blade at an obtuse angle to the shaft, the blade is sharp on all its presenting edges, and can be adjusted by the small thumb screw at the end, to cut to any desired depth.

Fig. 1.

The second step in the operation is accomplished by means of elevators, of which many modifications have been devised. In general, they are either blunt-edged for the purpose of elevating the normally adherent membrane, or sharp-edged for the purpose of dissecting free, abnormally adherent membrane. With an increasing facility of technic, the operator can elevate quite as rapidly and safely with the smaller and narrower elevators, as he can with the larger types, and, moreover, he can elevate in extremely narrow places inaccessible to the larger bladed elevators. The writer uses the sharp-edged ele-

vator of Dr. Freer, and the blunt-edged elevator of Dr. Abraham.

In commencing the elevation of the membrane of the convex side, it is well to begin above and gradually work down, because as a general rule the membrane of the upper half of the septum is found to be normally adherent, whereas it is in its lower half that we usually find the abnormally firm adherences. The deviations which are apt to give us the most trouble in elevating the membrane, are those where following an old fracture of the septum, there has been formed a sharp crest usually horizontal over which the membrane is apt to be exceedingly thinned out, or extremely adherent because of the formation of new connective tissue bands intimately connected with the septum.

Another difficult type is where there has been a preceding operation, either a spur has been removed with the saw, or an Asch operation has been performed. The cicatricial membrane over the site of the old operation is apt to be extremely thin and sometimes firmly adherent. When the septum is deviated to a sharp vertical angle in the nose, it is better to separate up to the angle and then defer elevating behind it until in the regular course of the operation the septum is removed up to the angle. Frequently we find the membrane very adherent at the anterior part of and just below a low horizontal crest.

The third step in the operation, the incision through the cartilage without incising the membrane of the concave side, is one of the most delicate steps in the procedure. This incision is made in the same line as the primary incision, and one must be exceedingly careful not to cut through the membrane of the opposite side, as a permanent perforation is apt to result at this point. In making this incision the writer uses the safety knife which he has devised for this purpose (Fig. 1). The movable blade is protruded and fixed, so that it cuts to a depth of one-sixteenth of an inch; if this is found to be insufficient, the blade is advanced a fraction further, the operator feeling secure that he cannot possibly cut deeper than the depth at which the blade is fixed. The cartilage having been cut through, the blunt elevator is inserted in the cut, and—

The fourth step, the elevation of the membrane of the concave side, is begun. On this side again it is well to begin

separating above, working backwards and then downwards, for we usually find the abnormal adherences either in the trough of the concavity or well down toward the floor anteriorly, so that it is well to approach these spots with as much of the necessary membrane freed as possible. Having thoroughly completed the separation of the membrane of this side we commence—

The fifth step, the removal of the deviated cartilaginous and bony septum. Unquestionably the quickest method of removing the cartilage is with Dr. Ballenger's swivel knife, and, in suitable cases, should always be employed, as it accomplishes this part of the operation safely, thoroughly and speedily. Before this knife was introduced, however, and at a time when the means of effecting the removal of the bony portion of the deviation was by the use of Grünwald's or similar forceps, and by chisels, the writer was led to devise

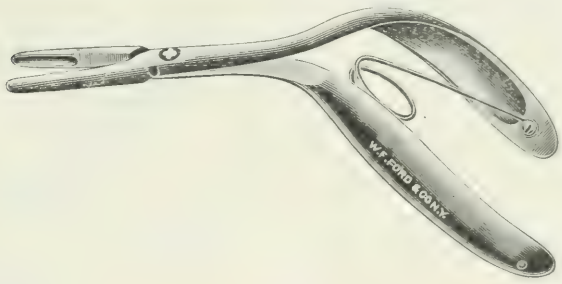

Fig. 2.

a forceps (Fig. 2) with long straight blades, which would have sufficient length and yet contain sufficient strength to remove any portion of the septum, either bony or cartilaginous, whose cutting edges would be sufficiently sharp and strong to cut through bone, and whose handles would be placed in such a position as to give the operator a clear and unobstructed view as the forceps grasp the bone or cartilage to be removed. They are introduced through the anterior incision with the blades closed, the blades are then allowed to spread and thus act as dilators, pushing the separated membrane of both sides away from and giving a clear view of the septum, which is grasped by the forceps and removed piece by piece cleanly and accurately. When the deviation

extends down toward the floor of the nose and includes the lower limit of the vomer and the maxillary ridge, it is extremely difficult in many cases to attack this portion of the deviation with a straight instrument. The writer has, therefore, adapted the straight forceps to meet this condition by modifying them so that the handle and length of the blade remain the same, but the cutting surface is limited to the tip of the forceps, which is turned down three-sixteenths of an inch. These forceps (Fig. 3) are made somewhat heavier owing to the increased thickness and density of the bone in this region. They are introduced and applied in the same manner as the straight forceps, but instead of looking along the upper edges of the blade, it is somewhat more convenient

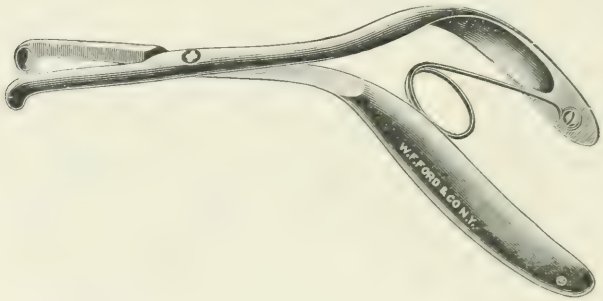

Fig. 3.

to tilt the handle up slightly and look directly at the cutting surface of the blade. Both forceps have given me great satisfaction in this work, and they are, therefore, respectfully recommended for your consideration.

There are several conditions which we may find associated with deviation of the septum, any one or more of which may require our consideration during or after the operation. It is with a view of citing my own experience and observations in these conditions, and in the hope of eliciting discussion thereon, that I make mention of them.

On examination of a nose with deviated septum, we may find the septum deviated to such an extent that it is found in close contact with either the middle or inferior turbinate, so that we are unable to pass a probe between the septum and turbinate. The question then arises: What is the best

mode of procedure in these cases? It has been the experience of the writer that we may find here either a real or an apparent adhesion to the turbinate, consequently attention to the condition is deferred until we reach it in our regular mode of procedure; that is, the mucoperichondrium and periosteum are separated as thoroughly as possible around the point of contact. When we come to the removal of the septum itself, we may find that it will shell out at this point, and that the membrane will swing clear of its apparent adhesion, or we may find that there is a real adhesion or synechia formed and we are then compelled to sacrifice the membrane at the point of adhesion.

Another condition which is a very frequent accompaniment of deviation, is a hypertrophied middle or inferior turbinate. Is it wiser to dispose of a sufficient portion of this hypertrophy at the time of operating on the septum, or to defer this and subject the patient to another operation later? The writer adopts the following plan: If the turbinate is large enough to project beyond the median line, a sufficient portion of it is always removed following the septal operation. If the turbinate is not enlarged to this extent, but is enlarged sufficiently to constitute an obstruction to nasal respiration, a sufficient portion of it is removed immediately following the septal operation, unless the operation has for technical reasons been unduly prolonged, or the patient does not bear the shock of the operation well, in which events it is removed at a subsequent period.

Still another condition which one meets is a circumscribed hypertrophy of the mucous membrane on the concave side of the septum, which has the appearance and somewhat the action of erectile tissue. By this is not meant the ordinary hyprtrophy of the mucous membrane usually found above the horizontal midplane of the septum about opposite the middle turbinate. The writer has observed it in six of his cases, in one of which the swelling was as large as the middle turbinate itself. If this condition is allowed to remain, it does not tend to spontaneous disappearance. In the treatment of this condition, the desire of the writer has been to efface the enlargement and at the same time preserve the surface mucous membrane. The method which has given me the best results so far, has been by means of electrolysis with parallel needles, plunging them into the enlargement

at several points and using from ten to fifteen milliamperes of current. This procedure is begun a week or ten days after the operation, and may have to be repeated several times at weekly intervals.

Again, there are cases in which the deviation extends up to and involves the nasal profile, so that there is an external deformity and the tip of the nose is deviated to either side. As a general rule in removing the septum, it is best not to approach the nasal profile nearer than one-quarter of an inch. In these cases the writer prefers to leave a little more than one-quarter of an inch, and after completing the submucous operation, proceeds as follows: That part of the septum remaining near the profile is fractured so that the tip of the nose may be brought to and retained in the middle line. Bismuth gauze packing is then introduced in the nose so as to retain the fractured cartilage in place. This packing is continued for about ten days and union of the fractured fragments is then complete enough to insure permanent relief from the external deformity.

Cocainization: The "sine qua non" of a good operation, is a good anesthetization of the field of operation. The happiest results have been secured in the following manner: First, a spray of adrenalin solution 1 to 1000, this is followed by a gentle swabbing of the entire field with a 4 per cent solution of cocain in a 1 to 4000 adrenalin solution, and then strips of cotton dipped in the same cocain adrenalin solution are well wrung out and applied over both sides of the septum and allowed to remain there for from thirty to thirty-five minutes. In this way I find that we are not bothered with the attacks of faintness which come on during the operation when we employ the stronger solutions for shorter periods of time, nor are we compelled to resort to further applications of cocain during the operation. When it is necessary to elevate the mucocutaneous covering at the anterior end of the septum, the subcutaneous injection of a one-half per cent solution of cocain in adrenalin must be resorted to at this point.

The treatment following the operation is exceedingly simple. Strips of gauze impregnated with bismuth subnitrate are lightly inserted into both nostrils. These are laid alongside the septum and keep the recently elevated mucoperichondrium and periosteum of both sides apposed. The upper layers of

this gauze are removed at the end of twenty-four hours. The lower layers are removed at the end of forty-eight hours. Following this, the patient is given an ointment of boric acid or yellow oxid of mercury to apply in the nostrils after irrigating with normal saline solution.

In conclusion, the writer begs to state that many of the ideas herein expressed are but a review of the suggestions of earlier writers, and in this reiteration of their views, he voices his appreciation of their sterling efforts in this field of work.

Convinced of the complete efficiency of the operation in all forms of septal deviation, and of its freedom from untoward after-effects, the writer, having never seen the slightest tendency to alteration of the nasal profile, or other unpleasant sequelae, has become an enthusiastic advocate of its still more universal adoption.

DISCUSSION.

Dr. Herbert E. Smyth desired in this connection to present a revolving knife for the submucous operation, which he presented to the New York Academy of Medicine at the February meeting, 1905.

It differed from the valuable instrument presented by Dr. Ballenger at the annual meeting of this society in Boston, last June, by having a single shaft which especially adapts it to cases where the deviation is very great, or the septum too thick for the fork of the other instrument.

Dr. George M. Case said that this operation was an ideal one for the relief of nasal stenosis arising from septal deviations. He had had only twelve operations, but had seen the operation performed many times in the Polyclinics of Professors Jansen in Berlin and Hajek in Vienna, and the results were eminently satisfactory. He believed it would supersede the older operations of Asch and Roe, especially where the deviation is limited to the cartilaginous portion of the septum; first, because the operation is almost a painless one under local anesthesia, and second, because the after-treatment is of much less duration, the slight packing necessary needs to be left in only a few days, a striking difference compared with wearing splints for a week or two, which are in themselves painful and not devoid of danger of infection. The

removal of the deviated portion of the nasal septum in no way endangered the shape of the nose, when done properly. Perforations will occasionally occur to all operators, especially with his first few operations, as the mistake is generally made of attempting to remove the mucous membrane and perichondrium from the extreme angle of the convexity or ridge early in the operation. This should be delayed until the maxillary spine is loosened with chisel, when it generally leaves easily. He had found the modified nasal bone forceps devised by Jansen a most useful instrument, being small and powerful, is easily manipulated in removing pieces of cartilage and bone, and for these reasons better than the ones shown by the reader.

Dr. Sargent F. Snow said that this timely contribution on submucous septal work had been well presented by Dr. McCoy, and had brought out principles of a method that he had practiced for ten or twelve years. The instruments described by the reader were, no doubt, useful in his hands and might become so in others', but he had found that a simple, sharp-pointed, slender knife to incise the mucous membrane, together with an ordinary earspoon to work up under and push back the periosteum, covers well that step of the work. A sharp cutting, ring curette with a strong shank (similar to the one used in clearing out ethmoids), bent at rather an acute angle, once started in the cartilage and semiosseous tissue, will rim out the deflected portion effectively, and, being so blunt on the external edge, obviates the danger of perforation on the opposite side of the septum. By it, the edges can be pared so that when the flap is brought down it covers it smoothly and invariably there is a prompt union with but little surface left for granulation.

Dr. J. F. McCaw said that the submucous resection of the nasal septum appealed to him strongly. He must take issue with Dr. Snow regarding his method of after-treatment and especially his method of not packing either nostril, depending upon the quiet of the patient to prevent postoperative bleeding. This step in the operation he considered one of the most important, and too much stress could not be put upon the necessity for smooth, regular and firm packing of each nostril. By this two purposes were accomplished: first, the prevention of postoperative hemorrhage, second, the obtaining of a much better functional result. Where no

packing or only light packing was used, hemotoma between the mucous membranes was apt to form, and after healing takes place would leave irregular elevations of septal thickenings, which interfered with an ideal result. His method was to pack each nostril smoothly and firmly for twenty-four hours, at the end of which time the gauze was removed and not replaced.

In closing the discussion, Dr. McCoy said that when a horizontal incision was made in conjunction with the vertical incision, it always retracted, leaving a surface to granulate which took several weeks to heal; whereas, when the single vertical incision was used, primary union and healing in a week usually followed. He added the Jansen-Middleton forceps were inadequate because the blade was too short and because the upper end of the handle was bulky and prevented a good view of the field of operation, points which were obviated in the forceps of his devising.

PAPER:

NON-DIPHTHERITIC MEMBRANOUS PHARYNGITIS AND RHINITIS WITH HYPERPYREXIA AND AN UNUSUAL NUMBER OF COMPLICATIONS—REPORT OF CASE.*

James F. McCaw, M. D.

The case which affords the basis for this paper, I saw in consultation with Dr. J. D. Spencer and Dr. C. N. Bibbins, March 15, 1904, when the following history was obtained.

Patient, female, aged 28 years. Mother died of pulmonary tuberculosis. While in New York City, about four and a half years ago, she developed an acute purulent otitis media, followed by mastoiditis on the left side, and was operated upon for the same by a very eminent general surgeon, after consultation with a prominent member of this society. From this she made an uneventful recovery, and had been perfectly well until six weeks before, when she suffered from an attack of influenza.

Although up and around, she was still weak and exhausted, not having fully recovered from her influenza attack, when her present illness began one week ago with a severe sore throat, a profuse watery nasal discharge, followed by a chill, high rise of temperature, rapid pulse and marked prostration. About twelve hours later, a pseudo-membrane began to develop, first on the tonsils, rapidly spreading to the soft palate and tongue, extending thence to the pharynx, post-nasal space and nares. The nostrils were so completely occluded that it was impossible to force air through them thirty-six hours from the beginning of her illness. Twelve hours later redness, swelling, edema and pain had developed over the superior maxillary and infraorbital region of both sides, more pronounced, however, over the right. Pain in the left ear, with subsequent purulent discharge and the same condition in the right, followed in quick succession.

I first saw the case at this stage of development and upon examination found the following conditions: Patient pro-

foundly prostrated, mental hebetude, temperature 104.5° F., pulse 126, and swallowing difficult. There were noticeable chemosis and proptosis of the right eye, redness and swelling over the antral and infraorbital region on each side, with pain and tenderness on pressure over the same areas. Nasal obstruction was complete. Each nostril was found occluded with a thick grayish-white membrane which completely filled the cavities. This membrane covered the post-nasal space, extended down the posterior and lateral pharyngeal walls to the tonsils and soft palate and involved the lateral walls of the buccal cavity and tongue as far forward as the tip. This pseudo-membrane was deposited on the tonsils, soft palate, tongue and buccal cavity in the form of large islands, between which was red and highly inflamed mucous membrane; while in the nasal chambers, post-nasal space and pharynx its continuity seemed to be unbroken. Any attempt at removal of this deposit left a raw and bleeding surface.

The membrana tympani in each ear was very highly inflamed, edematous and bulging, with a small perforation in the lower posterior quadrant of each, from which bead-like drops of pulsating pus were oozing. No swelling or redness over the mastoids, but slight tenderness on deep pressure over the left. Each membrana tympani was freely incised, and an examination of the pus from these and swabbings from the throat and nostrils showed staphylococci present in great numbers with a few streptococci. Klebs-Loefler bacillus was absent.

As a result of this finding, I attempted to clear the nostrils of the deposit as thoroughly as possible without treating the mucous membrane too harshly, and instituted regular syringing of the same with bichloride solution 1-10,000, followed by a mild alkaline solution every three hours. The other areas of infection were treated in a similar manner. This, together with supporting treatment, constituted my method of attack.

For the next four days, the general condition of the patient seemed to remain about the same, temperature ranged between 104° and 105.5° F., pulse 120 to 140; mental hebetude alternating with mild delirium supervened. About this time there was noticed less activity in the reformation of the false membrane, it was less tenaceous, coming away more easily and not leaving that extremely red and bleeding surface, as had previously occurred. The swelling and redness over the infra-

orbital and antral regions slowly subsided and tenderness disappeared. The false membrane had entirely disappeared in ten days and her general condition improved, but there had in the meantime appeared some swelling, redness and increased tenderness over the left mastoid region. About this time pronounced gastro-intestinal symptoms supervened, followed by tympanites, but only slight diarrhea and tenderness. To this was added a most annoying cystitis with constant and severe pain. With these developments her temperature again became high with frequent chilly sensations. A Widal test gave a negative result.

In view of her general condition, which was very bad at this time, I did not feel warranted in subjecting her to the shock of opening the mastoid, but was contented with keeping the middle ear thoroughly drained, meeting the other indications, and getting the patient in a condition where I felt her life would not be jeopardized by a mastoid operation. About one week from this time, I opened the mastoid, cutting down through the cicatricial tissue of the old wound opening into an abscess cavity. Although some difficulty was experienced in locating the antrum on account of distorted landmarks, this was finally accomplished. The zygomatic cells, those in the upper posterior portion, and the tip cells which had been left at the time of her previous operation were found involved and necrotic. All diseased tissue was thoroughly curetted away and the mastoid wound dressed in the usual manner.

From this the patient rallied nicely and was convalescing satisfactorily when two weeks later she began to complain of a fullness and pain in the left side of throat, temperature 101°, pulse accelerated. Upon examination there could be seen on the left side of the posterior wall of pharynx, on a line with the soft palate and extending upward, a deep purplish red, slightly tumefied area. Pronounced bulging of this area, crowding the soft palate forward, tenderness to pressure and an indurated feeling at a corresponding point on the neck, dysphagia and increased constitutional symptoms supervened in thirty-six hours; at which time a large retro-pharyngeal collection of pus was evacuated with immediate relief. From this time on the patient made a rather slow but uneventful recovery.

In medical literature there is a lack of unanimity among

authors regarding the nature and classification of these cases. They are described as diphtheritic, diphtheroid, fibrinous and membranous pharyngitis and rhinitis, phlegmonous pharyngitis, streptococcus infection, staphylococcus infection, etc., all of which is very confusing.

The question, then, of etiology and diagnosis becomes one of interest and importance. In my own case I must confess that at first I accepted the report of the bacteriologist with some skepticism, as the clinical evidence seemed to warrant a diagnosis of diphtheritic infection. However, after a more careful study of the case, we find abundant evidence to account for the unusual symptoms and phenomena present. Most authors tell us that non-diphtheritic, membranous or fibrinous rhinitis or pharyngitis is a mild disease with only slight constitutional symptoms, usually occurring in children, the temperature rarely going above 101° in the severer cases, and in some the symptoms are insignificant after the second day. While this may be so in the majority of cases, it was clearly the exception here. The wide distribution of the false membrane, with evident involvement of the nasal accessory sinuses, the hyperpyrexia and extreme prostration, evidence of a profound and virulent infection, at first seem incompatible with the bacteriological finding, but when it is considered that this patient was convalescing from an attack of influenza, her physical condition and resisting power of the tissues necessarily low, it is easy to account for the unusual activity and virulence of the invading organism, and the number of subsequent complications.

The mastoid complication was of added interest as further evidence in substantiating the views of those who strongly advocate the entire removal of all mastoid cells, including the zygomatic group and tip whenever the process is attacked surgically. Where this is not done and a second operation becomes necessary at any time, it is made more difficult from the destruction of the surgical landmarks.

In considering the complicating retro-pharyngeal abscess, the possibility of an extension or burrowing of pus from the mastoid wound might be thought of, but the wound was perfectly clean, and although searched for, no opening of communication could be detected. Another point against this view is the fact that the first evidence of its appearance was in the posterior pharyngeal wall and later was felt in the neck.

From this we conclude it was another complication of the primary infection.

The last, but by no means the least in interest, is the pathology of these cases. The fact has been clearly demonstrated by experimentation that general systematic infection may take place by dissemination of the poison from the upper air passages; in some cases passing through the lymphatics with great enlargement of the cervical lymph glands; in others directly into the blood current by way of the small capillaries and so reaching the general circulation. These facts have been proven beyond question and I think they are now accepted by most observers.

The question naturally suggests itself, why is it, that in some cases the clinical evidence of general infection are so much more profound, and the local manifestation so different from others, in which the infecting agent is apparently the same? Poynton, before the British Medical Association, sums up the situation very clearly when he says: "That border line between pathogenic and non-pathogenic is, in my opinion, the weak side of bacteriology at the present time. Because of the obscurity of this most pressing question, I have always fought hard against any assumption that whether a sore throat is septic, or rheumatic, or catarrhal, is simply a question of the resistance of the patient. In opposition, I maintain that we do not know when we look at such a throat whether the fate of the patient turns upon his resisting powers or upon some special properties in the infective agent. Certainly I think we shall admit, so far as diphtheria is concerned, much rests with the micro-organisms, and though in those other infections so vaguely termed septic, we are at present in confusion, I hold firmly to the view that when you have great clinical differences, then you have some special factor in the infective agent. I admit the factor of personal resistance, but not as the explanation of the great differences that there are between the illnesses that follow rheumatic, septic and catarrhal sore throats. In the search for these differences, difficult and slow though it may be, lies the hope of the discovery of the special poisons and their antidotes." He also alludes to the fact that probably infection from the throat may occur without any appreciable local symptoms, that the local inflammation is only a measure of the local disease, and not of the tendency to general infection.

PAPER:

SOME CASES OF MAXILLARY SINUS EMPYEMA TREATED INTRANASALLY.

H. Holbrook Curtis, M. D.

In a paper read before the American Laryngological, Rhinological and Otological Society in Lexington, Ky., May, 1903, and published in the *Laryngoscope* in October of that year, I gave an exhaustive review of the three classes of operation then in vogue for the treatment of antrum trouble.

The conclusions in that paper were deduced from an experience of some fifty cases I had up to that time operated on. I favored in that article a modified method of the entrance through the inferior meatus, first attributed to Cauldwell. Since then I have seen such excellent results from this operation that I will detail two cases which strike me as possessed of especial interest, on account of their long duration and almost helpless condition.

Case I.—Mrs. T., referred to me by Dr. Frank Markoe in April last. Presented the following interesting history: Patient, aged 43; an English lady, has had a suppuration from the left antrum since she was seven years of age.

The discharge came from a pinhole perforation between the first and second bicuspids, but occasioned little pain until she was 20 years old, when the periodical attack became more frequent. A dentist at that time cut into the gum and found an impacted tooth, which he removed.

This procedure did not stop the discharge or relieve the pain. Four years ago an English surgeon operated through the canine fossa and removed the remnants of a dentigerous cyst.

The antrum was packed for one day only and the discharge still continued, notwithstanding the after-treatment.

Three months afterwards a second operation was made through the alveolus and a gold tube inserted. A year afterward pain, discharge and facial swelling having continued,

a more radical operation was performed with curettage of the cavity. The wound was again packed for but one day only and a larger gold tube inserted. The patient one year afterwards came to Philadelphia to consult a dentist of international reputation, who gave it as his opinion that the tube was the cause of the continued suppuration, and removed it. He then attempted to stop the discharge by injecting tr. of iodin. This only made the pain increase to such an extent that ice bags on the face gave the only relief obtainable.

For the first time an offensive discharge appeared in the nose. The patient was then sent to California, where she spent over a year in great misery.

In April last I operated through the canine fossa, removing all the necrosed bone from the tract of the tube and scraping with great thoroughness the entire antrum. I then packed the cavity for ten days through the canine fossa opening. Next, I resected the greater part of the inferior turbinate body and made a large opening, removing the entire wall below the inferior turbinate attachment. The packing was then continued through this opening for ten more days, my attention meanwhile being given to closing the mouth wound, to prevent a possible reinfection from that source. It took, however, three months to accomplish this end, as the superior maxilla was necrosed to a great extent and the operative wound was a very extensive one. There has been no pain since the operation and not a drop of pus from the antrum since the mouth wound healed. I had previously operated on the frontal sinus of the same side, which was in a bad condition of empyema, but had been affected, so far as I could learn from the history, only for about a year before the patient came under my observation.

As regards the antrum in this case, I doubt whether a satisfactory result would have been attained without the aid of a very large nasal opening, through which packing with iodoform wool could be carried out.

Case II.—Mr. L., aged 36. Referred to me by Dr. Cheatham of Louisville. Left frontal sinus and antrum involved. Frontal sinus operated on by me in October, 1905. The patient was wearing through the alveolus of the third molar tooth a most remarkable drainage tube, which I exhibit.

The tube is of gold, but over a quarter of an inch in diam-

eter, one inch long, with a cup made to fit over the end, which was emptied of pus as occasion demanded. How this tube ever entered the antrum, I never can imagine. It struck the cavity, however, near its apex about a half inch above the floor, draining the cavity from a slightly lower level than the natural orifice. The discharge from the antrum was excessive even after the frontal sinus had been operated on. A very small frontal sinus was encountered, but the posterior cells were very much broken down, as well as some of the anterior cells and bulla of the ethmoid.

The outer walls of the meatus, both inferior and middle, were in such a necrosed state, that I removed the walls of both meati, together with the inferior turbinate attachment. Through this large orifice I was enabled to curette very easily the walls of the antrum, but never thought the disease could be overcome, and the alveolar tract healed by this means alone.

The packing with 5 per cent iodoform alternated by simple wool dressing was intermittently continued for some weeks, while the frontal sinus was being obliterated. Finally, the dressings were discontinued and the cavity douched until the antrum was found to be free from pus. This case had been a most distressing one, as the patient had been on the verge of nervous prostration for some time before coming to me for operation. The facility with which these two obstinate cases were cured by means of a very free opening in the nasal wall, through which they were packed and douched, together with most gratifying results I have obtained in some twenty cases treated in like manner, that had not previously been operated upon through the mouth, give me some ground for advancing the conclusion at which I have arrived; viz., that four-fifths of all cases of empyema of the antrum may be successfully treated without an anesthetic by the operation of removing the whole or a portion of the wall of the antrum forming the outer wall of the nasal cavity.

PAPER:

EMPYEMA OF FRONTAL, ETHMOIDAL, AND SPHENOIDAL CELLS, WITH ABSCESS IN ORBIT, SEROUS MENINGITIS, OPTIC NEURITIS, OTITIS MEDIA—OPERATION; RECOVERY.

NORTON L. WILSON, M. D.

On Christmas morning of last year, Mr. M. walked into my office and gave the following history: About two years ago he began to have a nasal catarrh. He was treated in one of the New York hospitals by cauterizing his inferior turbinate, since which time his nose has been more or less obstructed, because of adhesions forming between turbinate and septum. This deformity was removed last summer.

On several occasions he has suffered with severe pain in the head and especially over the left eye. The discharge from the nose has been thick and slightly offensive in odor, although for the past year his sense of smell has been impaired. The last two weeks he has been laid up in bed with considerable pain in the head and over the left eye. His temperature has been as high as 101°. The sight of the left eye has rapidly failed, and one week ago the left ear began to discharge, after a painful night.

EXAMINATION.

White, male, age 30; married; 5 feet 6 inches; weight, 120 pounds.

Family history negative. Had the usual diseases of childhood. Never had syphilis or any serious disease. Looked pale and weak and appeared somewhat apathetic. Examination of left ear showed pus in external auditory canal and large perforation in superior posterior quadrant. Mastoid was not tender and gave him no pain. Examination of pus

showed streptococcus. Examination of nose showed perforation of septum, which had occurred when the adhesion of the turbinate and septum had been freed. Pus was in the middle meatus and could be easily traced into the hiatus semilunaris, as the anterior end of the middle turbinate had been removed last summer.

The probe showed disease of the ethmoid and sphenoid cells, and in spite of careful manipulation would pass into the anterior ethmoid cells instead of the frontal sinus. The canula and trocar passed under the inferior turbinate into the antrum with a stream of warm saline solution, gave no evidence of antrum disease.

Transillumination of the antrum and frontal sinus was negative, but I felt sure the frontal sinus was involved, from the fact that I could not enter it through the frontal duct, and from the pain and tenderness over the sinus.

Examination of the left eye showed slight congestion of the conjunctiva, but no paralysis of any of the muscles. The ophthalmoscope revealed a well-marked papillitis, and tests showed that he was blind in the nasal half of this field.

He was sent to the hospital and prepared for the operation. Temperature, 99.6°; pulse, 100.

The following day I made a Killian operation, entering the frontal sinus from below, through the roof of the orbit at its inner angle.

The bridge of bone was left *in situ,* and as the sinus was large I had no trouble in working from above as well as below.

There was only a small amount of pus in the sinus, but the mucous membrane was thick and studded with granulations. The entire mucous membrane was removed and the bone found healthy.

I then attacked the anterior ethmoid cells, which were necrotic, as were the posterior cells.

In the region of the posterior cells the orbital wall was necrotic, and a hole about the size of a dime from which pus was oozing could be distinctly made out. The anterior wall of the sphenoid was likewise necrotic and was removed.

On removing the wall of the orbit, and especially in the region of the trochlear, I was materially assisted by the use of Kerrison's forceps.

The orbital fat protruded only slightly into the frontal sinus

after the wall was removed, and so far as I could see was of little or no benefit in filling up that cavity.

The wound was stitched through the eyebrow, which had been cut off with scissors and not shaved, and although I had been careful to make slight cross-cuts, so as to carefully approximate the parts, I did not find them of advantage and finally abandoned them and stitched the opposing surfaces just as I do in a mastoid wound. The frontal sinus and the roof of the nose were packed with sterile gauze and the ends came out alongside the nasal bone. I desire to state here that just before I operated, while the patient was on the table, I had a lumbar puncture made, and although the spinal fluid was clear, it spurted out, showing it was under pressure. He undoubtedly had a serous meningitis, and in considering the optic neuritis, this must not be forgotten as an etiologic factor, although I am of the opinion that pus in the orbit made pressure upon the optic nerve and thus produced blindness of the nasal half of the field. The notes taken at the time of dressings were as follows:

Second day after operation.—Patient complains of some pain in the head. Removed dressings. Wound looks well and drains in good condition. Nasal half of retina still blind, otherwise eye looks normal. Movements of the eye perfect. I was unable to determine whether or not diplopia existed because of the blindness. Patient can see my hand move when carried to the right side of the face, but cannot count fingers. Right lids, both upper and lower, were edematous. Bowels constipated. Ordered 1-6 grain calomel every hour until 1 grain is given. Apenta water in morning. Pulse 70, mouth temperature 98.4°. (This was the only mouth temperature, all others are rectal.)

Third day after operation.—Wound looks well. Removed packing, which appeared all right. Repacked. Right side of face edematous. Says he does not see well with right eye. Ophthalmoscope shows very slight haziness in optic nerve, with vessels somewhat engorged. Pulse 70, temperature 99.6°.

Fourth day.—Removed drain from ear. Discharge somewhat diminished. Washed nose with saline solution. Pulse 78, temperature 99°.

Fifth day.—Dressed wound. Removed five stitches from eyebrow. Wound healed. Drains only slightly soiled. Re-

packed. Removed drain from ear and repacked. Pulse 76, temperature 99°.

Sixth day—Removed drain from ear. Pulse 76, temperature 99°.

Seventh day—Removed packing which was considerably soiled and some of the pus had gotten into the eye and set up a conjunctivitis. A 1 per cent solution silver nitrate was applied to conjunctiva. Ear drain removed, which was only slightly soiled. Ophthalmoscope showed right eye clear. Left disc about same as it had been. Pulse 80, temperature 99.6°. At this juncture I had determined to make subjunctival injection of saline solution to see if I could hasten the absorption of the inflammatory products within the eye, but owing to the existing conjunctivitis I was deterred from this procedure, and as subsequent results show, it was entirely unnecessary, and no doubt would have falsely strengthened my belief in such treatment. I then determined to close the external wound and pack through the nose

I will not worry you with a further recital of each day's progress. Suffice it to say, that the membrana tympani healed on the ninth day. He left the hospital on the seventeenth day after operation, and was able to count my fingers with his left eye at two feet.

On January 28th, I ceased to pack the nose; there was very little discharge. The external wound had long since healed and the deformity was nil. The eyebrow had grown out sufficiently to cover the scar and only a red line could be seen on the side of the nose. His vision in the right eye $^{20}/_{20}$ or normal, and in the left eye $^{20}/_{50}+$, or three lines above normal. There was no diplopia. He had gained twelve pounds in flesh and felt well.

MEETING OF THE MIDDLE SECTION,

CHICAGO, FEBRUARY 24, 1906.

PAPER:

BULLET WOUND OF THE MASTOID—OPERATION —RECOVERY.

JAMES E. LOGAN, M. D.

Jacob H.; age, 48 years; residence, Oklahoma. Patient was shot in the right ear on Christmas day, 1896. The bullet, 38-calibre, passed first through the fleshy portion of right shoulder and entered the external meatus, lodging in the floor of the middle ear. Facial paralysis on right side immediately followed. An operation was performed at once for removal of the bullet, but without success.

The middle ear began to suppurate while he was in the hospital. Discharge stopped after a month or six weeks had elapsed. These attacks of suppuration came on at intervals, to be followed by periods of cessation until 1902, after which time the suppurative process continued without interruption. Pain at times was very severe in the region of the ear and on the top of the head, but no other symptoms referable to the head were present, except the constant facial paralysis.

This man was operated upon by Dr. Bisby of Chandler, Oklahoma, July 6, 1905, but the doctor was unable to locate the bullet. The suppurative process continued with increasing activity, and at last patient was sent to me by Dr. Bisby on September 11, 1905.

This patient was first examined at my clinic September 11, 1905, and his condition was about as described above: Very little pain, temperature 99 1/5°, pulse 80, tongue coated. The tissues covering the mastoid and extending over the occiput were in a high state of inflammation and a fistulous opening existed just beneath the lobe of the ear, allowing some of the discharge to pass through this channel. Much necrosis was evident, which accounted for the terrible odor emitted from the wound. The patient was sent to the hospital to be prepared for an operation. On September 18th, he was again

presented before the class, and the operation performed with the assistance of Drs. Hill and Wyatt.

The mastoid was opened just back of the auricle, and after thoroughly opening up the infected area and enlarging the meatus, we succeeded in locating the bullet in the floor of the middle ear. Extensive necrosis had taken place, so much so that all of the anatomical outlines were destroyed. The facial nerve had been severed and the bony roof of the antrum was absent, exposing a part of the dura. Necrosis of the external plate extended as far back as the emissary vein.

Dead bone was removed wherever found, and a noticeable feature was the excessive hemorrhage that occurred throughout the whole procedure.

This, I took, resulted from the extensive cellulitis that had existed there for many months.

The wound was treated as in an ordinary radical operation. The horizontal incision was sutured and three stitches were taken in the upper portion of the postauricular incision. The lower portion of the same was left open. The cavity was thoroughly packed with iodoform gauze, and the usual external dressing applied. The patient made a rapid and uneventful recovery. The temperature at no time exceeded 99 4/5°.

He left the hospital just two weeks after the operation. In a recent letter from him, he reports his ear in good condition, with no discharge and no pain.

This case is reported, not for the purpose of throwing any light upon aural surgery, but simply to call your attention to a condition which rarely serves as a cause—that of gunshot injury. I have not taken occasion to look into the literature of gunshot wounds of the ear, but I dare say the like of this is of very rare occurrence.

DISCUSSION.

Dr. George F. Keiper said he had had a duplicate of the essayist's experience in the case of a negro, a fugitive from justice, who, in an altercation, was hit by a bullet in the right ear, so that the drum was totally destroyed. He could find none of the ossicles, and it was possible by a probe to feel the bullet in the middle ear. He decided to operate, but unfortunately was prevented from so doing, as the man has ever since been a fugitive from justice.

Dr. John J. Kyle said that those who had had the oppor-

tunity of seeing Makin's beautiful work on his surgical experiences in South Africa would find a report of four cases of gunshot wound of the temporal bone. Makin also reported observations of three other cases. Makin's experience was that where facial paralysis followed any injury of the temporal bone from a bullet, it was usually permanent. In the cases observed by Makin there was no direct severance of the facial nerve, but the injury was the result of concussion. He explained that we might have concussion of the facial nerve the same as a concussion of the brain; that there could be the same molecular changes as in the spinal cord.

Dr. R. B. Canfield recently had at the University Clinic a case which was somewhat similar to the one narrated. The patient was a child, four or five years old, who had been shot with what was supposed to be a .22-caliber bullet, twenty-four hours before he saw it. Examination showed the child to be in good condition; the middle ear had not been entered. There was a circular perforation in the posterior external canal, well into the mastoid. An X-ray picture showed an irregular mass in the mastoid and behind it. Operation revealed not a 22-caliber bullet, but forty mustard seed shot and two paper wads. One paper wad was imbedded in the posterior belly of the digastric, one passed through the wall of the sinus, and forty shot were scattered through the mastoid, and a few perforated the sigmoid groove and spread about the sinus. He took out forty shot. The next day the father of the child counted the shot-cartridges, and he found, to the speaker's dismay, that of the other three he counted, one contained sixty-five, one a hundred and fifty and one a hundred and forty mustard seed shot. The father sent home and got some of the shot from the same box, and they averaged forty-five. The five mustard seed shot not found in the mastoid did not seem to bother the patient. The patient made a complete recovery.

Dr. Logan, in closing, said he reported the case on account of its uniqueness. He thought there must be a great many conditions caused by gunshot injury such as he had reported, although he had not taken pains to look up the literature. A number of X-ray pictures were taken, but he had never been able by them to outline the bullet satisfactorily. He simply did the operation as an exploratory one, with the expectation of going after the bullet wherever it was located.

PRESENTATION OF SPECIMENS AND ORIGINAL DRAWINGS.

HANAU W. LOEB, M. D.

DISCUSSION.

Dr. Robert Levy considered the specimens and drawings unusually fine, only approached by the drawings in the Gefrierdurschnitte, published by Fraenkel some years ago. When they were first published, he thought they were magnificent, but their beauty faded into insignificance as compared with those exhibited by Dr. Loeb. They could not compare in beauty or in definiteness of detail with those presented by Dr. Loeb.

Dr. James E. Logan expressed the hope that Dr. Loeb would publish these drawings at an early date, as they added a great deal to the teaching armamentarium of anyone who was interested in this particular work, as they were so beautiful and distinct.

Dr. John F. Barnhill said it was impossible to divorce ourselves as specialists from the broad field of medicine, and it was along this line that we must think when we looked upon these beautiful sections and still more beautiful drawings. He could well remember, when he began the specialty which he was pursuing, that it was the common custom to look upon us as men who knew nothing more than those who were able to cleanse the nose, remove a tonsil or cauterize the turbinates. We were growing in the minds of the profession as a specialty, and it was such a presentation as this which would enable us to go before the whole medical profession with something tangible upon which we could base the claim that we were better men than we formerly were. He was convinced that our future lay very largely, in so far as the efficacy of the profession was

concerned, in a more complete study of the open sinuses of the skull. It could not be otherwise than that, for many of the diseases that the general practitioner saw, as well as those which we saw, were due to infection. He was coming more and more to believe that a large number of diseases of all kinds were infective in their nature, and we could not study the pathologic findings of Fraenkel and those who had made these examinations in the deadhouse so often and had found that in at least forty per cent of the cases, one or the other of these sinuses was found filled with pus, without coming to the conclusion that some of the pus was absorbed, and that many of the septic conditions found by practitioners of medicine were referable to the head sinuses.

Dr. R. B. Canfield spoke with reference to the method which Dr. Loeb had followed in preserving his specimens. He said he understood the solution in which they were preserved was formalin. Preservation in formalin allowed a very considerable amount of shrinkage of all tissue. In his experience, such specimens, when preserved in Kaiserling's solution, shrank less than if preserved in formalin.

Dr. Loeb, in closing, said, with reference to the criticism of Dr. Canfield, that with this method of preparation in formalin shrinkage was comparatively nil. Of the hundreds of sections that had been made, not only of the head, but of the body throughout, one was surprised to see how the organs retained their first condition after years of handling. He did not think there was any objection to the formalin method on account of shrinkage, because bone shrinkage would be immaterial.

PAPER:

ANESTHESIA IN THE TONSIL AND ADENOID OPERATIONS.

L. C. Cline, M. D.

It is with some timidity that I bring the subject of anesthesia, for the removal of adenoids and tonsils, before this section. Believing as I do that the last word has not been spoken, and in as much as our Chairman has indicated to me that we are to lay aside formalities and have some heart to heart talks; and because of a desire to know and to do the right thing is my apology for introducing this subject.

Some of the points I wish to suggest for discussion are:

(1) Is it necessary to use a general anesthesia in all or in the majority of operations for adenoids and tonsils?

(2) If so, what is to be the choice of an anesthetic?

(3) Cannot these operations be done just as efficiently with less shock and danger to life and post-operative complications without a general anesthetic?

It is generally conceded that there is greater danger from anesthesia for operations in the upper respiratory tracts than in other parts of the body, which is doubtless due to the hypersensitive and the inhibitory power of the nerve supply to these regions.

The most important point to consider in the choice of an anesthetic is its safety.

Anesthesia is a long step toward death. Dr. Wendell Holmes once said, "When we take an anesthetic we purchase a round-trip ticket, but not all use the return half." All discussion on this subject must necessarily hinge on the choice and manner of administration.

The details of operation are insignificant compared with the life of the patient. The advocacy of one anesthetic over another, because it is easily and quietly given, would not suffice for an explanation in case the patient did not survive.

The majority that have reached the age of reason would rather undergo a few moments of suffocation at the start than quietly go to sleep with an added chance of not awakening.

I am indebted to Dr. F. N. Shipp of our city for the following quotation and statistics from a recent valuable paper upon this subject:

"F. W. Huitt's statistics covering over a million administrations show that death resulted once in every 3162 inhalations of chloroform, while with ether once in every 16,302 proved fatal. He concludes that chloroform is over five times as dangerous as ether.

Let those who use chloroform as the anesthetic of choice put this clearly to their patients, tell them that chloroform is easy to take, but that the danger from it is five times as great as from the inhalation of ether. If all patients were told this and given their choice of anesthetics, chloroform would be seldom used except in those few cases where ether is contra-indicated."

Of the various substances that have been used for anesthesia, the great majority of the profession has practically settled down to the employment of ether and chloroform. Experience seems to indicate that there are no other agents which act so well as these two liquids.

Ethyl chlorid is being used to a considerable extent. Potter gives a death rate for its use of one in 1500. Ware collected 11,207 cases of its use with one death. Wilcox claims ethyl chlorid to be as safe as nitrous oxid gas.

If we accept statistics we must give ether the preference. Some argue that chloroform is safer with children and practice giving it to the children under the age of ten. According to recent observations this view is erroneous.

Three methods of administering ether are in general use, namely, with the inhaler of the Allis type, the nitrous oxid ether method and the more recent open drop method, all of which have their advantages. The combination of nitrous oxid and ether has the advantage of using less ether, thereby lessening the post-operative complications. This method has the disadvantage of an expensive complicated apparatus which makes it more adapted to hospital use.

A comparison of a large number of cases in which ether was given with inhalers of the Allis or Esmarch type, with a

similar number of cases of the open drop method, show that the latter method has much in its favor compared with the former. The amount of ether used is much less than with the inhaler and the proper mixture of air is assured which greatly lessens the danger of after-complications.

The death rate from general anesthesia in these operations should receive more serious consideration. A few years ago fourteen deaths were reported in England inside of three years. Not long since eighteen deaths were published from the same cause, by a New York physician whose name I cannot now recall. When this subject is squarely and fairly put to parents they will nearly all, in my experience, tell you that they would prefer that their child would suffer a few moments of pain rather than be put to sleep and take the added chance that they will not awaken.

In the light of these experiences I have practiced in a large measure, doing these operations without a general anesthetic, using local and in some cases no anesthetic. With a full appreciation of the criticism that the above statement is likely to bring forth and the belief by some that a thorough operation cannot be done except under general anesthesia, I am ready to be put right, if convinced my method is wrong.

I believe in the majority of cases it is possible to do as clean and as thorough an operation with a local as well as with a general anesthetic.

In regard to complete removal, it has been observed and demonstrated that recurrence and new growths occur occasionally after all methods of operation. My custom is to have two assistants. One takes the child on the lap or on the right knee, leaning forward against the patient's shoulder, grasping the body, arms of patient at sides, feet off the floor if possible. The second assistant grasps the top of the head over the right shoulder of the first assistant, both to hold the patient firmly. A tongue depressor is passed over the tongue, touching the pharyngeal wall, when the mouth will at once come wide open, the forceps or curette is then placed in position behind the palate, the tongue depressor is now withdrawn partially or completely so that the child has no obstruction to breathing. The majority of children in this position if firmly held will struggle but little. The curette is passed high up in the vault and moved about until the mass of the tonsil or ade-

noid is felt to be grasped. A firm sweep with a little rocking motion will remove the mass. A second and third sweep on the sides will complete the work. If the forceps are used, I usually finish with the curette.

These operations should not be discussed in the presence of the patient. I find that with a little preliminary kind treatment the operation can almost be completed before the child realizes what has happened, and they are certainly, with me, at least, in better shape than after a general anesthesia.

Practically the same preparation is carried out in removing tonsils.

There are other points in connection with this subject that might be of interest to all of us which I hope will be brought out in the discussion.

DISCUSSION.

Dr. M. A. Goldstein said he was a firm advocate, especially in later years, of the quicker and simpler form of anesthesia, namely, that produced by nitrous gas or any other combination. He did not consider that either the operation for adenoids or for the removal of the faucial tonsil had a sufficiently lengthy technic, nor was it of sufficient gravity from an operative point of view, to place the patient under a general anesthetic. There was a certain amount of risk attending general anesthesia, whether it be ether or chloroform. There were other disadvantages which ether and chloroform produced. In years gone by he had used chloroform with the patient in the erect position to the point of primary anesthesia, in order to render the patient more or less tractable and to overcome any violent resistance or struggle. Operating in the recumbent position, or in the old-fashioned, overhanging head position, for the removal of adenoids, with general anesthesia, made the adenoid operation much more of a capital performance than he thought was justified. What we really endeavored to accomplish was to avoid the nervous shock and dread of the little ones in operating on them. He had now a nitrous oxid gas apparatus in his office and his assistants were trained to use nitrous oxid gas or the somnoform of the English rhinologists, which was a combination of nitrous oxid, bromid and chlorid of ethyl, and the operation could be done with great facility so far as the anesthetic was concerned. Anesthesia

only lasted a minute or two until the patient was ready, and within a minute or two after the operation the patient was ready to assist the operator in expectorating blood and to help him in the after-treatment. He had seen absolutely no ill-effects of any consequence following the use of nitrous oxid gas or somnoform.

Another question which was perhaps of value was the long after-effects of general anesthesia. After ether or chloroform anesthesia, for an hour or more, the patient was unable to assist the operator in any after-treament which he might prescribe. Anesthesia by nitrous oxid gas was as simple as local anesthesia by cocain, eucain or any other of the local applications that were swabbed on the tonsil. All in all, the anesthesia produced by nitrous oxid gas, or some of its combinations, was such a simple and easily carried out procedure that it could be used in every form of tonsil and adenoid operation without any possibility of bad effect.

Dr. John J. Kyle spoke of stovain as an anesthetic in the removal of tonsils and adenoids. For the past year he had used it hypodermatically in 10 per cent solution. He said it was a French preparation, brought out some year and a half ago by a French chemist. It had one-half the toxic property of cocain; it was slightly antiseptic; it would preserve the solution of adrenalin for a long time, which cocain would not do. Its effect was more lasting than that of cocain, although slower in taking effect. He made up a 10 per cent solution of stovain in 1-1000 adrenalin, and usually injected from five to fifteen drops in each tonsil, and if he was going to remove adenoids, he made a topical application of 20 per cent solution of stovain to the soft palate, because there was usually great pain in the removal of adenoids from the insertion of the curette. He had operated on a great many young girls and young boys, and if one could get their confidence, he could do the operation under local anesthesia. The syringe he used was designed by Dr. Pynchon. The results were always satisfactory. The slight antiseptic influence of the stovain was of great value in these operations. There was more or less infection following the removal of tonsils and adenoids, and we should not overlook the fact that this infection was sometimes very severe, and for that reason these operations should be looked upon as capital procedures, and

patients should be confined for a few days to a hospital or to rooms free from dust and all forms of irritating substances.

Dr. Joseph C. Beck stated that after twelve years' experience in general surgery and special work, three days ago he had a disagreeable experience of having had a patient die on the table from ether anesthesia. They labored for an hour and a quarter trying to resuscitate the patient, but their efforts were futile. The drop method was used in this case in giving the anesthetic, the case being one of pyemia secondary to an infection of the ear. Notwithstanding every precaution was taken in administering the anesthetic, it was evident that the patient died from the anesthetic alone. The bad effects from ether anesthesia were noticed, namely, slow breathing, cyanosis and sweating. Until this unfortunate accident, he considered ether the best general anesthetic, and safest anesthetic for the removal of tonsils and adenoids where the operator had to dissect out the tonsils in children. In adults, however, he had been using local anesthesia, injecting solutions of cocain-adrenalin, for the removal of tonsils in ordinary cases, and had not met with any trouble. Dr. Ballenger and he used this form of anesthesia in their clinics, employing quite a strong solution of cocain in adrenalin. He had used lactate of eucain in combination with adrenalin for the same purpose. In young children, it was his practice to remove tonsils and adenoids, where he did simply a tonsillotomy in the case of large tonsils, to clip them off with tonsillotome and remove the adenoids, using the same preparation and method prescribed by the essayist. He agreed with Dr. Kyle that such operations should, if possible, be done in hospitals, not only because of the infection which may follow, as one could not thoroughly disinfect in these cases, and there was more or less infection after these operations, but because the patient was tired after the operation, and it gave him a rest for twenty-four or forty-eight hours, with proper after-care.

Dr. Edwin Pynchon said, as regards the selection of the anesthetic, it depended entirely upon the age of the patient and the condition of the tonsils. In small children, who could be held, in whom the tonsils protruded, he thought it was wisest not to administer an anesthetic, but to hold the patient firmly and rigidly and go ahead and do the work. In cases where the tonsil was slightly buried, and where in order to re-

move it properly by dissection, a general anesthetic of some kind was necessary, he was in favor of the suggestion made by Dr. Kyle, that this was decidedly a hospital operation. As regards adenectomy, the operation can be done easily and safely in the office under nitrous oxid gas, or at a dentist's office. He had in the past taken patients to the offices of dentists, and had used nitrous oxid for adenoid operations. He had at present one of Clark's new outfits for using a combination of nitrous oxid and oxygen. He had not used it very much thus far, but was pleased with the way it worked, and said he was going to use it for adenoid operations in the office.

The danger of chloroform was largely due to the fact that children had defective noses and throats, wherein the blood was not properly oxygenated, so that there was a condition of semi-asphyxiation to begin with, and this combined with the extra-asphyxiation from the chloroform, was attended with danger. The child resists chloroform, and after a while is forced to take in a very deep breath, and it was this deep breath that was attended with danger, in that the vapor of the chloroform, which had not been inhaled, on account of the child not breathing, was suddenly drawn into the lungs. He had quite frequently used the A. C. E. mixture by the drop method, with pleasing results.

In cases where a local anesthetic could be used, he was certainly in favor of it. He had used local anesthesia in children as young as 6 years, for the cautery dissection operation, but ordinarily about 12 or 13 years. For young children, and those over 13 and adults, he invariably used local anesthesia.

Dr. Derrick T. Vail agreed with all that had been said in regard to the serious nature of this operation, which was rendered serious on account of the anesthetic side of it. He always gave a general anesthetic for this operation, because he believed it was a major operation and a hospital operation. Occasionally, he, like others, was led astray by either having read or heard some one speak on this subject like the essayist had done, being thereby induced to try other methods, and almost invariably he had given them up after a single trial, on account of screaming of the patient and fright of the people who brought the patient, together with the excitement which accompanied the operation. He had thought of the

method of anesthetizing the adenoid mass, so that it could be removed without a general anesthetic, and he had employed this process only once, but with great satisfaction. The method consisted in having the patient lie flat on the back, with head well back, so that the solution of cocain and adrenalin would gravitate back to the adenoid mass. He thought it was a better way of anesthetizing the vault of the pharynx than the method of applying it to the pharyngeal vault by means of a cotton swab. He used 2 per cent cocain and 1-2000 adrenalin. Taking this idea and going one step further, he had inserted a long canula attached to a hypodermatic syringe, loaded with a 1 per cent solution of cocain, and passed the end of the canula into the mass of adenoids through the nasal route and injecting a few drops directly into the adenoid mass. He considered this a simple procedure, and one which he thought should be successful. In this region we had the basilar process of the occipital bone a considerable distance from the sphenoidal cavity. There was no danger of entering the middle ear, and there was only one structure which one might enter in passing the needle along the inferior meatus of the nose, and that was the adenoid mass in the vault of the pharynx. It was not necessary to have a sharp needle, as a blunt one would answer quite as well. One could pass the needle into one side of the mass, then on the other, and inject a few drops of the anesthetic directly into the tissues.

Dr. Hanau W. Loeb endorsed what the essayist had said in reference to the removal of ordinary adenoids generally and uncomplicated tonsils without general anesthetic. After an experience of ten years in the use of chloroform, he had practically discarded it for the last five years in favor of cocain anesthesia, except in cases where careful dissection of the tonsils was required in children. He had watched patients carefully to determine their temper, their action, during and after the operation, and after five years of very considerable experience, both in clinical and private practice, he was justified in saying that for him, at least, it surpassed any other anesthetic. He could not say about the method of removal of tonsils and the desirability of their removal under chloroform on the part of other operators. But for himself, the operation could be more satisfactorily done, so far as removal of a considerable amount of tissue is concerned, under cocain anes-

thesia, as contrasted with general anesthesia which he formerly employed. If one operated on a few hundred cases in the course of a large practice, it might be wise to take chances, but when the cases ran up, sooner or later, and when one least expected it, there would be a death from chloroform, ether, or from nitrous oxid gas, as such cases had been reported. Having had a serious fright once in a case, he had been led to give up general anesthetics for these operations.

While the refinements of application suggested by Dr. Vail and others might be well enough, he had found it best to get the confidence of the patient, whether the patient be 2 or 15 years of age, by telling the patient the truth. To the youngest child he would say he was going to use bad-tasting medicine; this would convince the patient that he was telling he truth, and generally he did not cry out. The second and third applications were made in quick succession, and while the applicator was in the epipharynx, the Jansen gag was introduced, and the applicator pulled out, and the operation completed in a few moments. One assistant generally held the patient, and often the mouth-gag as well; but sometimes another assistant was required to hold the mouth-gag, and at other times the operator held it himself while operating. The practical point was that when the matter was explained to mothers, they were usually more willing to have an operation done than if they were told that a serious operation had to be performed and it was necessary to give a general anesthetic. If the mothers were told that possibly the children would die under chloroform or other general anesthetic, it would influence them to select the simpler form of anesthesia. In this way the parents had been more willing and more little patients had been relieved by having an operation performed than otherwise would have been the result.

Recurrences in his practice, on account of improved technic, were less than formerly. He brought this question up at the American Medical Association ten years ago. We were not removing adenoids quite as well then as now. Then, one case in twenty recurred. That percentage of recurrences has been reduced. The operation in any man's practice should be made as simple as possible, and should be performed in such a way that the child and parents were willing to undergo operation again if necessary.

Looking over his experience, children now returned to his office the next day without crying, whereas he did not think he had ever given chloroform or ether without the child beginning to cry as soon as it saw him.

Dr. John F. Barnhill thought it was very largely a question of personal equation as to whether a general anesthetic was given or not, and that this must ever be a great factor. He had heard a similar discussion on several occasions, and quite agreed with everything Dr. Loeb had said. His practice in the last seven or eight years had been similar to that of the last speaker. It was quite possible that Dr. Loeb had taught him many things in connection with these cases. In the last eight or ten years it had seemed to the speaker that the ordinary or average case of adenoids could be successfully, simply, quickly and almost painlessly operated upon, that it occurred to him we were not justified in giving a general anesthetic, in the majority of cases. His experience has been in the case of little children under 5 that the child would cry infinitely more from the use of cocain than from the removal of the adenoids. In a number of children in whom there was only an adenoid to be removed, he put on absolutely nothing; he made the operation as simple as could be. No instruments were used by the little patient. Nothing was said to the parent about a grave operation, nor anything to frighten the mother. In a few seconds, with the curette, the adenoid could be removed, and he really believed that the patient ought to be up and around shortly thereafter; but no violent exercise should be taken. When the patient was operated upon in the upright position, drainage was much better, and he seldom favored hospital retention in these cases. Of course, for the removal of embedded tonsils in children, a general anesthetic was frequently necessary, as the operation was too long and too painful without it. In adults, however, he had not used a general anesthetic for embedded tonsils, unless it was insisted upon by the patient himself. He thought he was able to do the operation much better without general anesthesia than with it.

Dr. George F. Keiper said in discussing the question of anesthesia with ether, for instance, he did not know whether the members meant that complete anesthesia must be induced or not. Personally, he had never found it necessary to have

complete anesthesia in these cases, because by so doing he thought we increased the danger from the anesthetic itself.

He described and demonstrated a method of holding a child by assistants, so that the mouth-gag could be applied and the adenoid tissue removed without the child being able to struggle. He did not like to use adrenalin for this operation, because his experience had been that once in a while hemorrhage occurred, and on that account he had given up the use of adrenalin. He preferred cocain, as it was a very good hemostatic.

Dr. Robert Levy referred to his experience with somnoform, which he had used a little less than a year. He had had the same man to give the anesthetic for him, and had asked him to prepare a brief statement, which he had done. This he would read later. He said the old question of whether one should use a general anesthetic or not in tonsil and adenoid operations, came up perennially, and while he thought the greatest number of operations had been done under general anesthesia, it was not the effect produced upon the patient at the time of the operation that was most injurious, but it was the after-effect, and in practically all cases recently he had done the operation without a general anesthetic. He recalled one of the most excessive serious after-effects in a case operated upon for the removal of adenoids by another practitioner. Two years after the child had been operated upon, he saw him; the child was very nervous, and the mother informed him he was really in a serious condition, which she attributed solely to the effect of the operation performed two years previously.

Recently the speaker operated upon a case in his clinic. Every now and then he operated under general anesthesia for obvious reasons, and the physician, whose patient this was, came to him a day or two afterwards and said: "For heaven's sake, doctor, don't ever do that again; I have been at the patient's house twice today trying to quiet the patient and the family. The patient is in a perfectly wretched condition." It was a week before that child was right. These were the after-effects, not the effect at the time of the operation. He had used all the anesthetics recommended—chloroform, ether, nitrous oxid, including local anesthesia.

Dr. Levy then read the following report from his anesthetist

(Dr. Frank W. Kenney) of the cases that had been anesthetized with somnoform:

"The larger number of these were from 4 to 8 years of age. A few under 4, and up to 18 years. I believe the case of yesterday (Monday) to be the only one where we have failed to get the requisite depth of anesthesia at the first attempt, it, however, being no fault of the anesthetic, in my opinion, but rather to a prolonged holding of the breath on the patient's part. For the smaller children, an average of 2 c.c. has been given, a trifle more for the larger ones. Rigidity has been observed to a greater or less extent in most cases of boys from 15 to 18 years of age, while the young children and adults of maturer years have shown none. I have noticed but few cases of nausea or vomiting in your work, and, marking its absence in other lines of work, am inclined to think it due, when it occurs in nose and throat cases, to the swallowing of blood. Owing to the necessity of getting complete anesthesia in your cases before work is begun (as the mask must be removed), a moderate degree of cyanosis is observed in most cases. This is not noticeable in general surgery, as in the latter, manipulation of the patient is possible almost immediately after the mask is applied."

Dr. Levy expressed himself as being strongly in favor of somnoform, because it took effect very rapidly, and this effect lasted sufficiently long to do a tonsil and adenoid operation; and, if necessary to separate the tonsils from the pillars and free them from adhesions, one could give the anesthetic twice. In a recent case he separated the tonsils freely under the first anesthesia, and during the second anesthesia, which was usually more prolonged, he removed both the tonsils and adenoids.

Dr. Wilbur W. Bulette said that eleven years ago, when he located in Pueblo, he was called upon a year after that to do an adenoid and tonsil operation in a child about 5 years of age, the son of a consumptive. The father of the child insisted upon the family physician giving an anesthetic. Chloroform was administered. He did both the tonsillotomy and adenectomy at the parents' house, and just as he got through the operation the patient died like that (snapping the fingers).

He said that after one had gone through such an experi-

ence as that it did not take him long to decide whether he wanted to resort to general or local anesthesia in this class of cases. Such an experience was very unpleasant to have.

Dr. Cline, in closing the discussion, said that the fact that three or four cases of death had been reported during the discussion, showed conclusively that any practitioner or all might have such an accident happen to them. He had never had the misfortune to have a death from anesthesia, but had been on the verge of it two or three times. He thought it was our duty in these cases to operate all we could without an anesthetic. He did not believe in ordinary cases in sending the patient to a hospital and making a capital operation out of it. He was aware that there were some cases in which it was really necessary to give anesthetics. He did not wish to be understood as not believing in anesthetics in certain cases, but the majority of these patients ought to be persuaded to have the work done without an anesthetic. Considering the subject as a whole, he thought it was wrong to give anesthetics to every patient who came along. In his dispensary and private practice, he operated on these cases in his office, after which the patient went home and did not come back and say all sorts of things about their troubles. Frequently he operated on adenoids and tonsils separately. He would treat these patients the same as he would treat his own children. He would put the matter squarely and clearly to the father and mother of the child, as to the danger from the use of chloroform or ether, and invariably the parents would rather that the child suffer a little pain and be able to expectorate blood, than to take the risk of having a general anesthetic administered.

PAPER:

SOME EVILS OF MOUTH-BREATHING.

C. P. Linhart, M. D.

In trying to find the origin of many cases of chronic pharyngitis, my suspicions were attracted to mouth-breathing as one of the common causes of this complaint. With scarcely an exception, patients suffering from chronic pharyngitis and laryngitis have more or less difficulty in inhaling sufficient air through the nose. This is particularly noticeable when exercising briskly out of doors during the cold and damp season of the year. If anyone should take the trouble to observe the people on a cold winter morning as they walk to their places of business, he would be surprised at the number who are inhaling the cold, raw air through the open mouth directly into their lungs. The thin and delicate membrane of the pharynx and larynx is utterly incapable of giving moisture to, and heating, the air to its proper condition before entering the lungs. The cold air overstimulates the vasomotor nerve endings controlling the small capillaries of the throat. There is first a contraction and blanching of the membrane from the cold, followed by a relaxation of the capillary walls, and a pouring out of secretion from the mucous glands in this region. The work that this membrane is called upon to do is entirely beyond its capabilities, it becomes thinner, the patient complains of a dryness in throat, and in course of time the result is a chronic pharyngitis.

The question as to the original cause of mouth-breathing would seem a little difficult to answer. Very young children, I think as a rule, have little difficulty in breathing through the nose. It is only in later childhood, subsequent to the hypertrophy of the adenoid tissue in the vault of the pharynx, and hypertrophy of the tonsils, that the children begin to breathe through the mouth.

It seems proper to suggest that our habits of living are

such as to bring about these very conditions. In the first place, the children are often housed in over-heated and ill-ventilated rooms and coddled in heavier wraps than is necessary for their health. This hot-house preparation illy prepares them for the vigorous and sudden changes that they undergo in passing from these warm rooms into the winter air. These sudden changes are probably a strong factor in bringing about the congestion of the mucous membrane and underlying tissue of the turbinals in the nose, and increasing the hypertrophy of the glandular tissue in the pharynx.

"Does not the continual tropic house warmth actually reduce the tone of the tissues and make them more susceptible to bacterial invasion? The thought is naturally suggested that perhaps cold air has hygienic as well as therapeutic uses. We rather look upon hot weather as relaxing and destructive of vitality, and expect health with return of cold weather. Brook trout perish if the water they breathe is raised only a few degrees in temperature. There is enough in this matter to cause us to think about it a little. If so many cured tuberculous patients are now sleeping in cold air every night and living in it in the daytime, too, as much as possible, perhaps the rest of us are only injuring ourselves by the opposite course. Only a few years ago the cold-air fiend, who slept with windows wide open in the coldest winter, was considered a crank. Perhaps he will prove to have been the only sensible one among us, and was merely imitating the ways of his ancestors who had practically no way of warming their homes."

As it is the function of the turbinals to supply sufficient moisture to the air, and probably regulate its temperature as it passes into the lungs, it naturally follows that the air must be made to pass through the nose, over the turbinals, in order that they may be in proper condition to do their work.

One of the probable evils of mouth-breathing in early life, is the raising of the palatine arch by undue pressure from the inhalation of air through the mouth. This excessive arching of the hard palate, which is also the floor of the nose, encroaches upon the space in the nose. During development the septum would naturally grow so as to fill the space allotted to it in the nose. Now that space, as has been shown, is consequently narrowed in its perpendicular diameter and it

naturally follows that the septum will bend to one side or the other. Where a person has a high arched palate, we expect to find either a deflected septum in the shape of a large curve, or a sharp kink or spur. The latter is nearly always seen along the line where the vomer joins the perpendicular plate of the ethmoid.

A popular impression prevails that deflections and spurs of the septum are caused by a blow on the nose sometimes during development. While it is easy by suggestive questioning to get a history of an injury to the nose, in almost every instance of deflected septum, I usually find that when the patient volunteers the information of a blow on the nose, that the injury has been sufficient to cause a considerable thickening of the whole septal wall, from the consequent inflammation, which is not found in ordinary septal deformities.

There is no doubt that mouth-breathing, with its consequent high arching of the palate, is responsible for the peculiar shaping of the face, seen in many children suffering from adenoids. It is also a factor in causing the protruding and misshapen teeth of the upper jaw. Dr. C. A. Hawley tells me that in looking over twenty-nine plaster casts of corrected deformities of the teeth from narrowing of the upper jaw, he found nineteen with histories of operations for removal of adenoids. These cases were taken at random; and he further states that he had no doubt that some of the others had nasal or postnasal obstruction. Dr. Hawley called my attention to another interesting point, that a high arched palate and narrow posterior nares might have the relation to each other of cause and effect.

The secretion of the nose is more or less bactericidal. The dust in the air on entering the nose is filtered through the moistened vibrissae, and also becomes deposited on the viscid membranes of the turbinals, consequently, the mouth-breather lacking this natural protection, is more susceptible to bacterial invasion, and on account of the discomfort and annoyance of breathing through the mouth, will not inhale as deeply as he ought; therefore, there is no sufficient oxygenation of the blood and there is consequently lack of body tone.

There is no doubt that considerable disturbance to digestion is caused by allowing the mucopurulent material from the

nasopharynx to get into the stomach; in fact, it is next to impossible to prevent young children from swallowing it. I had a patient who had been troubled with indigestion for several years, tell me that it entirely disappeared after being relieved of this annoyance from a chronic nasal catarrh. I venture to say that the fermentative changes which take place in the mouth of a mouth-breather, have an injurious effect on salivary secretions sufficient to interfere materially with the digestion of starchy foods, and this in turn would lessen the stimulative effect on the peptic glands of the stomach.

Breathing through the nose develops the muscles that dilate the nostrils, consequently we find narrow nostrils in mouth-breathers. Furthermore, where the obstruction in the nose is confined to one side, it naturally follows that the narrow nostrils will be on that side.

I have had a number of cases of pharyngeal irritation that I could trace to no other cause than a partially occluded nostril, and it seemed to me that the air volume being so much heavier on one side gave it a cork-screw motion as it passed down the pharynx. This whirling and uneven pressure of the air might cause an irritation of the throat by producing an unusual dryness in one part and too little in another. This would account for the little inspissated lumps of mucus found in this class of cases, in the vault of the pharynx. Of course, one must take into account the fact that so large a volume of air passing in one nostril would not get the heat and moisture that it would if both sides were more even in caliber. Whatever the cause, there is always a marked improvement where the entrance of air through each side of the nose is more evenly balanced.

If we accept the foregoing statements as facts, it is easily understood how the habit of breathing through the mouth is so difficult to overcome, and the importance of keeping a clear passageway in the respiratory tract of children, and whenever there is any hindrance to normal breathing, even from a transient "cold," it should have immediate attention. Any obstruction should be removed by surgical means, and the patient encouraged in his effort to breathe through the nose. Even later in life, when the bones of the mouth and nose are completely ossified, the openings of the nares can be enlarged by proper breathing exercises.

The following axioms are recommended for keeping the nose in a normal condition:

Cool living rooms.
Well ventilated sleeping rooms.
Cold bath, especially for the neck and spine.
Dry clothing.
Simple foods.
Regular habits.
Moderate daily exercise, and
Always breathe through the nose.

DISCUSSION.

Dr. Charles S. Means said that mouth-breathing was deleterious in many ways. Being a member of the Board of Education in Columbus, he had had a good deal to do with school children, and he had taken up the matter of having the teachers report the cases of children to the Board who were deficient in mentality, and the rule had been that they had found that children, who started to go to school at 6 years of age, and were very bright, in a short time developed mouth-breathing. Their nasal space was contracted. Very soon the fact was developed that they were more and more deficient in their school work, and by the time they were advanced to the fifth or sixth grade, they were not carrying on their studies with the ability anywhere near approaching that they did when they started, and it had been proven it was due to a lack of aeration. He thought such a paper, if placed in the hands of school teachers, would do considerable good. Such children should be given proper exercise in breathing and in developing the nasal cavities. Many children became mouth-breathers from a lack of cleanliness of the nasal passages; many parents did not furnish their children with handkerchiefs with which to wipe their noses, consequently, some of them used their coat-sleeves. He thought hundreds of people developed mouth-breathing through laziness or a lack of knowledge that they should keep the nose clean. This should be taught to young children: They should breathe through the nose whenever it is possible to do so. If there is an obstruction from mucus, it should be blown out.

Dr. John F. Barnhill said he understood the essayist to make the statement that mouth-breathing caused irregularity of the teeth and the high cathedral arch. If this was true, he would disagree with it. He did not believe that the cathedral arch, or irregular teeth, were due to mouth-breathing except indirectly. We all had seen a number of these trying cases in which there was much deformity of the parts on account of trouble with the teeth. In these, it was difficult to bring about a cure. The cases which he had seen have had narrow faces, thin noses, and it occurred to him that they must have been born with some degree of deformity with which he saw them later in life. He had in cases like this in which there were adenoids or enlarged tonsils, or hypertrophied conditions of the nose, been extremely cautious as to the promises he had made them concerning subsequent full and easy breathing through the nose, because he believed it was impossible for a child to do so, even after the obstruction was removed, until the aid of the dentist was sought at a later period in life to spread the arch of the palate to its normal position. He mentioned this as a feature frequently met with, and one which was exceedingly difficult to overcome.

Dr. Edwin Pynchon disagreed with the last speaker with regard to mouth-breathing being due to irregularity of the teeth. When children breathed through the mouth, and it was open, the lower jaw did not press against the upper jaw, and consequently the teeth grew downward; in the same way, there was no stretching of the buccinator muscle, causing lateral contraction of the maxillaries. He said that Dr. Talbot, a dentist of Chicago, had gone elaborately into this matter, had made experiments and had quite conclusively proven that such was the case, and this was his explanation of the long face and the irregularity of the teeth and high dental arch. In so far as the location of the hard palate was concerned, it did not materially differ in two patients who started out alike, but one of whom, through mouth-breathing, eventually developed a long face and irregular teeth. It was not that the top of the hard palate changed, but it was that the teeth and alveolar process grew farther down for want of resistance.

As regards the deflection of the nasal septum and nasal deformities which many claimed were due to the fact that

the hard palate had grown upwards, and that, therefore, the septum became bent, the reason the septum became bent was owing to the lack of breathing through the nose. With the mouth-breather, the nose was not properly used, and it increased the hyperemia of the nose, with chronic irritation, and, therefore, excessive growth. This explained how the septum became either thickened or bent.

Dr. Linhart asked how was it that some children, 2 years of age, had high arched palates?

Dr. Pynchon said he could not explain it, as he had not seen anything of the kind. He had not observed a high arched palate in a young child. These high arched palates occurred from 2 to 6, and 6 to 10 years of age. At least, this had been his experience and observation.

With reference to aprosexia, he believed this condition from mouth-breathing came from two causes; first, the air was not properly prepared for the lungs, so that proper oxygenation did not take place, and incidentally carbon dioxid did not escape, as shown by Ballenger; second, owing to the fact that the nose was not being properly used, the sinuses were not properly ventilated, and the sinuses, being lined with mucous membrane, gave out a secretion, which secretion was not evaporated as it should be, and which, consequently, to a certain extent, underwent decomposition, and it was owing to the retention of this secretion in the sinuses and absorption therefrom that the child acquired the so-called condition of aprosexia.

Dr. Willis S. Anderson said that the troubles that followed mouth-breathing could be largely referred to the fact that there was deficient oxygenation of the blood, and the regular respiratory functions were not carried on properly.

In regard to high arched palates and deflected septa, with various obstructions, he had many times thought that we took a narrow view of the matter. One cause of nasal obstruction that had not been mentioned, was a bowing forward of the vertebral arch. It was not an unusual thing to notice in a young child that in examining the pharynx the distance between the vertebral column and the soft palate was slight, and even if we operated on these cases and removed any of the lymphoid hypertrophied condition of the nasopharynx, they did not have free nasal breathing. The high arched palate

and deflected septa were the result of evolution. If we studied the skulls of the ancient races, we would find that the septa were almost always straight. In the American negro, the septum was straight. In the civilized American, and in the Caucassian races, deflections of the septum were common. It was also noticed that the last molar tooth was short, imperfectly developed in many persons, while in the Indian and negro, uncivilized races, it was well developed. In other words, the jaws were growing smaller as we evolved into a higher form of civilization, and various changes took place differing in different individuals.

There was one point to which he desired especially to call attention, namely, that if we wished to relieve so-called catarrhal conditions in the throat and affections of the voice, we must look in the majority of cases to the nose. The socalled catarrh of the laity was very often kept up by improper nasal breathing, and instead of treating the larynx and pharynx by applications and sprays, if we restored normal nasal breathing, the pharynx and larynx would take care of themselves.

Dr. Linhart, in closing the discussion, said there was undoubtedly some relation of cause and effect between a typical septum and a high arched palate, because they were found usually together, and he suggested this as one of the possible causes. He thanked the members for their suggestions and criticisms of his paper. The object of the paper was to bring out suggestions and criticisms, as by so doing certain theories might be advanced which would have to be modified.

PRESENTATION OF CASES.

ANGULAR DEVIATION OF THE SEPTUM.

Dr. William L. Ballenger, of Chicago, showed a patient who had had a typical angular deviation of the septum, with large ridge running posteriorly and superiorly, and with a bowing at the top of the septum on the opposite side in the region of the middle turbinate body. He showed this case to illustrate the beautiful results of the submucous resection of the septum. The septum was made as straight as a shingle. This type of septum was not possible to completely correct by any other recognized septum operation. He had also removed the tonsils from this patient, by dissection under cocain anesthesia. The tonsils were removed with their capsule intact. The condition of the fauces was rendered pliable and the recurrent attacks of tonsillitis had not recurred. The catarrhal inflammation of the Eustachian tubes was improved.

SARCOMA OF THE NOSE.

The next case was one of sarcoma of the nose which he exhibited before the annual meeting of this Society two years ago, and upon which he had operated by a temporary resection of the nose with a satisfactory result. Thus far there was no sign of recurrence. There was an occasional discharge of necrotic bone, and there was some pus discharge. Pain also occasionally occurred. This and the pus discharge were controlled by the use of the 500 candle power leucodescent lamp.

PAPER:

SOME INSTRUMENTS.

FRANK ALLPORT, M. D.

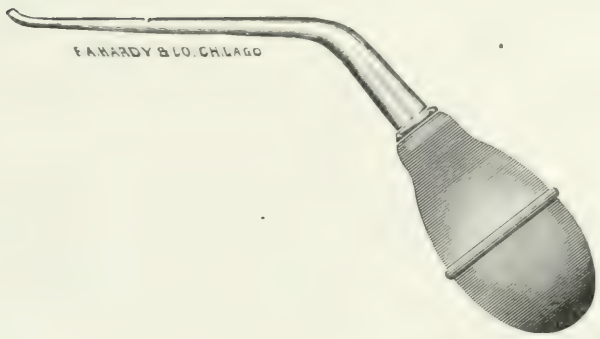

Fig. 1.

A Middle Ear Syringe:

Practically all middle ear syringes are unclean and frequently out of order. I submit one of glass and rubber that can always be ready for use, and is so cheap that the surgeon can afford to possess a number of them. An objection has been raised to it that the point is not large enough to enter minute perforations of the drum-head. In answer to this I contend that no middle ear should be irrigated through a minute drum-head perforation. Such tympanic irrigations should be confined to those cases where the irrigating liquid can find a ready exit, otherwise dangerous complications are likely to ensue.

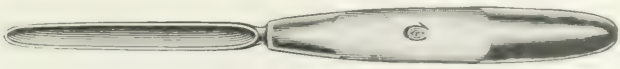

Fig. 2.

A Mastoid Periostotome:

In stripping the mastoid process of its periosteum after the primary incision has been accomplished, an effort should be

made to preserve all possible periosteum. This purpose is liable to be defeated by the sharp scraping instruments usually employed, which tear and mangle the periosteum. I desire to recommend the instrument shown in the drawing as one that can be passed underneath the periosteum, thus lifting and not tearing it from the bone. It has a small end and a large end, and the latter should be used where much force is indicated. This instrument cannot be used when the lower portion of the mastoid is to be cleaned, for at this portion of the bone the roughened surface and tendinous attachments of the muscles make the soft tissue cling to the irregular bone surface with such tenacity that one of the scraping periosteotomes and a pair of strong scissors must be used. My instrument, however, can be used at all other portions of the bone.

The narrow end of the instrument has been gently concavo-convexed to fit the bony external auditory canal, and is used in the radical mastoid operation to pass between the cartilaginous and the bony meatus, in order to thoroughly separate them and facilitate the subsequent steps of the operation. This instrument is not useful in secondary mastoid operations where dense cicatricial bands connect the soft tissue with the bone.

Fig. 3.

A Permanent Needle:

Having been much troubled with the breaking of needles in closing mastoid wounds, I have for a long time used the instrument shown in the drawing. Near the point of the needle is a small opening that can be opened and closed by pressing the button near the handle. The needle is pushed through the soft tissue with the small perforation closed, the suture is then doubled and placed in the opening which is then closed. The needle is then withdrawn with the suture, and one end of the suture pulled through, when the suture will be ready for tying. I only use this instrument in my

buried catgut sutures in the radical operation, as for closing the outside lips of the wound I use the metal sutures proposed by Michel. .

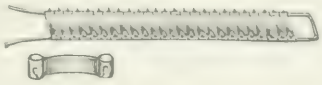

Fig. 4.

The Michel Sutures, Etc.:

For closing the external lips of the mastoid wound, I have for some time been using with great satisfaction the metal Michel suture, a drawing of which is here given.

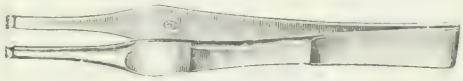

Fig. 5.

These sutures are easily and quickly applied, scarcely ever produce stitch abscesses and produce a quicker healing and a more imperceptible line of cicatrix than any sutures I have ever employed. Several instruments or appliances are necessary for their advantageous employment, viz., a wire suture holder which enables the surgeon to conveniently take hold

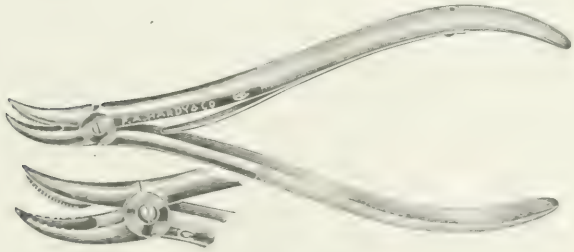

Fig. 6.

of the suture, a strong pair of forceps with points so constructed as to firmly grasp and hold the suture and forcefully grasp and hold the two sides of the wound, and a pair of forceps for removing the sutures after the wound has healed. The two ends of the removing forceps are pointed so that one end may be gently insinuated underneath the middle of the bent suture after it has been holding the soft tissues together for a few days. The two blades of the forceps are then brought firmly together at the middle of the suture, one blade being underneath and the other blade being over the suture; this will, of course, cause the two outer ends of the suture to separate, thus removing the sharp points from the

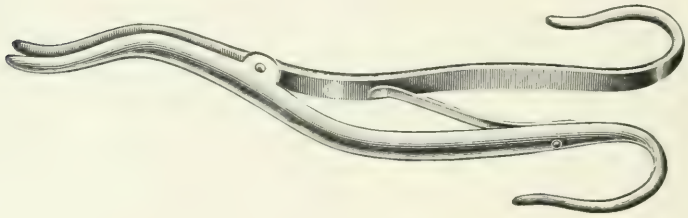

Fig. 7.

flesh. The suture is now liberated and may be cast aside or straightened out and used again. In applying a suture it should be held on the wire loop or suture-holder by an assistant, the surgeon should grasp the suture with the forceps and pull it off from the loop, an assistant should grasp the two lips of the wound with strong forceps, bring them together and hold them up, thus approximated, as prominently as possible for the benefit and convenience of the surgeon, who should now forcibly clamp the sutures around the lips of the wound and bring the two ends of the sutures, armed with the little needle points, as close together as possible by firm pressure of the strong forceps. Five or six sutures are usually sufficient, even in a large mastoid wound. I usually remove about half the sutures in three days and the balance in six or seven days.

A Meatal Divulsor:

For those who split the cartilaginous meatus after the method of Panse in producing flaps after the radical mastoid operation, the instrument here shown will prove of value. A grooved director is used by some to guide the knife, strong forceps, widely spread, by others, but for a long time I have used the "meatal divulsor" as I call it. The instrument is introduced through the meatus, and passed through to its further end and spread so that the cartilaginous meatus is placed upon a stretch. A knife can now be passed into the tympanic end of the meatus and the cartilaginous wall easily and accurately severed up to the desired point at the conchal rim, spreading the divulsor more and more as the incision advances toward the concha.

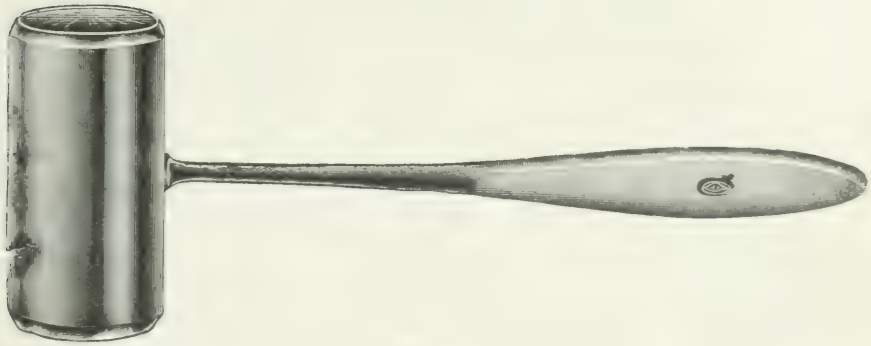

Fig. 8.

A Metal Covered Wooden Mallet:

For mastoid work, a silver or lead mallet is too heavy and harsh; and a raw-hide mallet is too soft, and soon becomes useless from boiling; a wood mallet also becomes cracked and worthless from boiling. I employ, therefore, a good-sized mallet made of lignum vita, encased in steel, with a strong steel handle. It is imperishable and thoroughly satisfactory.

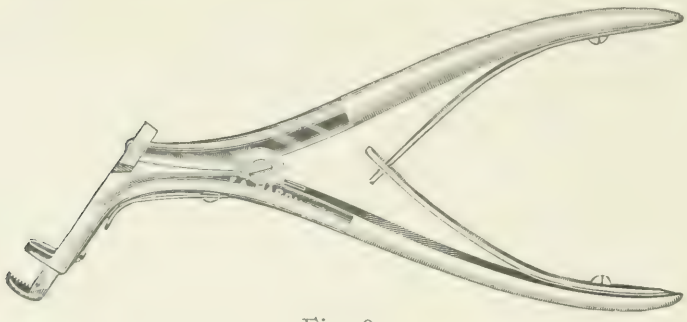

Fig. 9.

A Bone Crusher:

An important step in the radical mastoid operation is the breaking down of the posterior wall of the meatus. Injury to the facial nerve, semicircular canal, etc., may follow this procedure. The complete clearing away of the upper portion of the bony meatus, without injury to surrounding parts, is much facilitated if a small pathway through the bone to the tympanic cavity, etc., can be distinctly blazed by some instrument. I have found the "bone crusher," here pictured, to be of great service for this purpose. Before using it the mastoid cavity, antrum, etc., should be thoroughly curetted and cleaned. The crusher has not sufficient power and strength (and should not have) to break down the entire thickness of meatal wall. The surgeon should proceed, therefore, as if expecting to destroy the meatal wall with the chisel and mallet alone, and carve away a considerable portion of the bony wall with these instruments. After, perhaps, one-half of the work has been accomplished, the footplate of the crusher should be carefully insinuated through the antrum to the middle ear, the handle firmly depressed so as to raise the footplate of the instrument away from the inner tympanic wall, and the arms of the handle forcefully brought together which will, of course, crush down the bone contained between the jaws of the instrument. The blades are not broad, but narrow, and the channel thus produced is, therefore, of small dimensions, but it is quite sufficient to point the way for further bone destruction which can now be easily and safely accomplished by chisel, rongeur and curette.

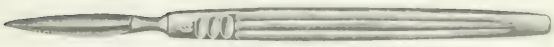

Fig. 10.

Two Knives:

One of the recognized defects in the radical mastoid operation has been the deformity often produced by an abnormally wide and gaping meatus. This trouble I have been able to entirely dissipate by the use of knives which I will now describe, my description referring, of course, as will be seen, to the Panse flap which I almost exclusively use. After every thing is ready for flap making and wound closure, I insert the double edged knife here pictured into the raw, pos-

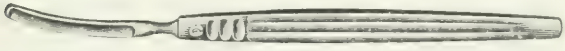

Fig. 11.

terior portion of the auricle, as near as possible to the middle of the edge of the meatus. The knife is carefully pushed forwards and made to reappear at the middle of the meato-conchal edge; after enlarging the opening a little the knife is withdrawn and the blunt pointed knife here shown is made to take its place, as the see-saw movement necessary to finish the incision up and down would be likely to produce multiple punctures on the other side of the meatus. The blunt point of the other knife renders the subsequent procedures free from such embarrassments, and the fact that the blade convexes forward on the edge, enables the surgeon to more effectively complete the remote corners of the incision. The knife should be carried up as far as desired, and then down, always keeping in view the meato-conchal edge, and keeping the line of incision just a litte behind this edge. In this way the meatal opening is only enlarged a trifle, and the surgeon can be absolutely sure that a constant and non-deforming result will occur. The backward incision along the cartilaginous meatus can now be completed by the divulsor and knife as already described.

Fig. 12.

A Gauze Packer:

A good instrument for packing gauze is desirable not only at the time of the mastoid operation, but more particularly at the subsequent dressings. I have already described the packer here shown, but, as two important modifications have been made in it, I venture to refer to it again. It has a cone-shaped point, flat and round at the distal extremity, which gradually diminishes in bulk as the shank of the instrument is reached, thus enabling the operator to firmly pack down the gauze without any tendency to displace the packing as the instrument is withdrawn. The narrow portion of the shank as formerly made was flexible; it is now stiff and firm. The distal end used to be smooth; it is now roughened and catches the gauze better.

Fig. 13.

A Hook Probe:

I have already described this hook probe some years ago, as a useful instrument for finding and dislocating the ossicles in the operation for ossiculectomy, and also as a generally useful ear hook and probe. I now, however, find it exceedingly efficacious in the mastoid operation as a probe for the detection of carious spots, and especially for the locating of openings in the roof of the tympanum, aditus or antrum. It simply consists of a slender shank, bent at right angles at the end and tipped with a small round ball.

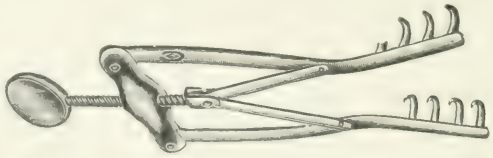

Fig. 14.

The Mastoid Retractor:

I trust I may be pardoned for again referring to my mastoid retractors, now in quite general use for so many years.

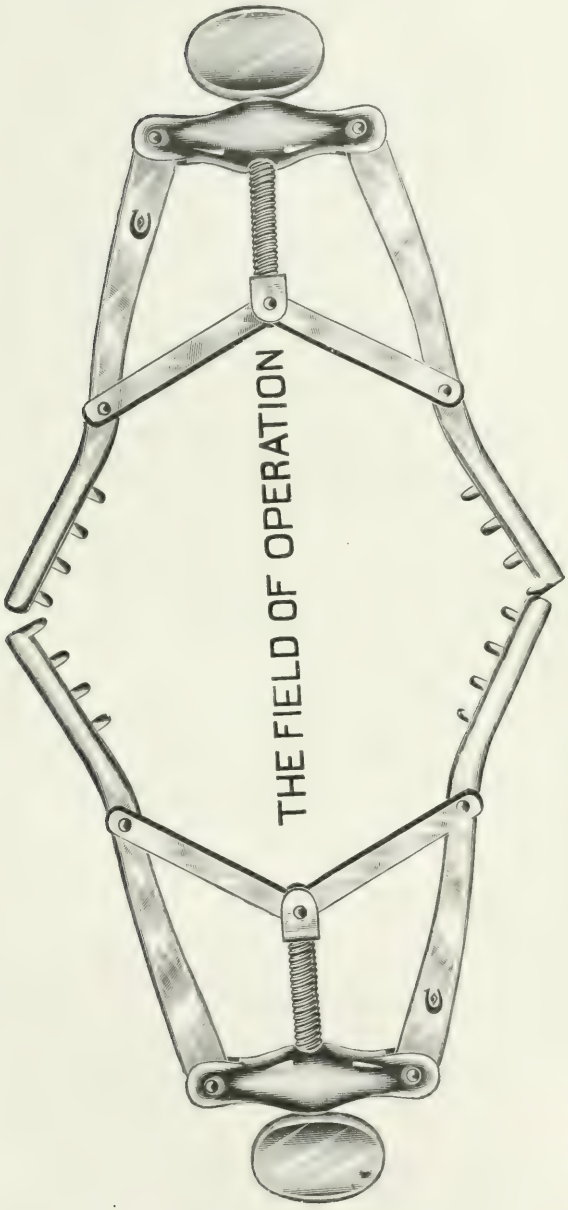

Fig. 15.

They have been modified somewhat of late by making them much stronger so that they possess great power and do not break. The skin incision should be long enough to allow the operator to place two pairs of these retractors in the opening, one pair in the upper angle of the wound and another pair in the lower angle. The teeth of the arms of the retractors should be placed underneath the periosteum and the arms should then be expanded to their utmost limits by turning the thumbscrews at the base of the instrument. I rarely use an artery forceps, and when both retractors are thus widely separated, a perfect and comparatively bloodless field of operation is observed between the four arms of the two retractors. Some operators still employ the old hand retractors, one for each side of the wound, but these retractors necessitate extra hands and arms around the operative field, and they do not control hemorrhage, and no one can always maintain steady and uniform hand retraction.

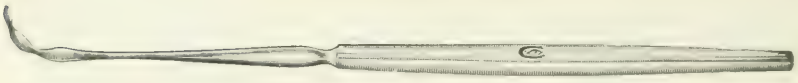

Fig. 16.

A Pillar Separator:

Robertson's pillar separator usually acts well in separating the pillar from the tonsil, preparatory to a removal of the latter; but it does not always cut well, which is embarrassing to the operator and frequently painful to the patient on account of the forcible dragging of the blade on the yielding soft tissue. I beg to suggest a knife with a wavy blade, like a bread knife, which, when sharp, by the use of a gentle to and fro movement, easily and comparatively painlessly cuts the soft tissue without much effort.

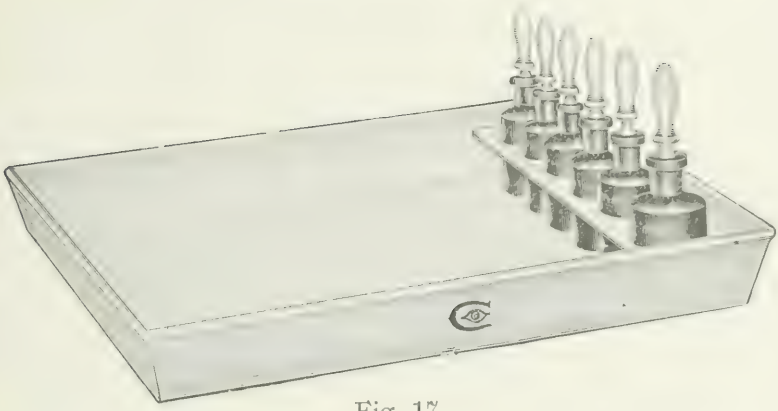

Fig. 17.

A Bedside Tray:

It would seem easy to purchase a small and convenient tray for carrying a few eye and ear instruments, solutions, cotton, etc., from bed to bed in a hospital, and yet a faithful search in instrument stores has failed to produce one. I beg, therefore, to suggest one so simple that apologies seem necessary for the suggestion, and yet one that has

Fig. 18.

seemed to satisfactorily answer the purpose for the past year at St. Luke's Hospital. It is simply a small tray for holding a few bottles, and a space of sufficient size for holding miscellaneous articles, such as droppers, gauze, cotton, instruments, etc. I think it undesirable to make many partitions in a small bedside tray like the one under consideration, and have found it much more convenient to simply lay in the one large space such articles as are absolutely necessary in a tour of the hospital.

Curetting the tympanic orifice of the Eustachian tube is an important part of the radical mastoid operation, as, if this is done, granulation tissue usually remains and a mucous secre-

tion from the unclosed tube may become a constant and annoying sequel of the operation. This little procedure may be accomplished with a small sharp spoon curette, and Whiting has devised a conical shaped bur which quickly rims out the orifice. I have, however, found his bur to be over-large for the purpose, and I do not like the conical shape of his bur, as it may be too energetic in its action, especially when attached to such a strong handle which not only invites undue force, but also obstructs the view of the bur and tube which should always be kept in sight. I, therefore, use a bur with round outlines, which, it would seem, is capable of doing less harm, and also one possessing a straight handle (without a hand cross-bar, as in Whiting's) which can be rolled between the fingers when rimming out the tube orifice. It is not likely that much force will be employed in using this instrument, and the bar and tube can always be kept clearly in view.

PRESENTATION OF SPECIMENS AND PATIENTS.

FRONTAL SINUS DISEASES.

Dr. Norval H. Pierce presented two cases of frontal sinus disease, both having been operated upon by Killian's method. He said they had this peculiarity in common, that while the symptoms were directed entirely to one side, in operating it was found that both sinuses were equally diseased, the partition between them having disappeared by necrosis.

The first one was an atypical case with a typical course. A diagnosis was made of frontal sinus disease, not so much because of the discharge from the nose as because of the history of frequent attacks of exophthalmos, pain over the eye and tenderness on pressure above the inner angle of the eye. The patient, he said, had a discharge from the nose at the time he saw him, but he could not see any discharge, nor could he see any special reason for believing that there had been a discharge from the nose. At the operation, an enormous frontal sinus was found. The first case cleared up beautifully. There was now little or no discharge, and the case was as near cured as a case could be. The indicated operation on the septum could now be done at any time. He said there was no pus from any of the accessory cavities of the nose, and that the operation of submucous resection was indicated.

FRONTAL SINUSITIS.

Dr. Joseph C. Beck presented a case of left frontal sinusitis, with this symptom, that for the last six months, between the hours of 4 and 5 in the morning, fluid came from the postnasal space, would continue to escape for some time and then this would cease until the following morning. This fluid was very foul and bitter. The histologic examination, he said, was of the greatest importance. Such an examination had been made by The Columbus Medical Laboratories on several occasions, and this was the last report: Fluid evacuated in quantities through the posterior naris amounted to 20 c.c.,

its color being grayish-brown, showing granular masses, with a thick sediment of brownish fluid, with disagreeable odor. Microscopic examination showed flakes of epithelium mixed with bacteria. A few pus cells and a few blood cells were found, also staphylococci, leptothrix, saprophytic bacilli and tubercle bacilli. Chemical examination showed albumin present, blood present, not decomposed, and sugar absent. Cultures were made and staphylococci and the bacillus of influenza were found in numbers. Saprophytic bacteria were numerous, while other bacteria were absent. The fluid came from the space where decomposition was active rather than from the abscess. He removed the middle turbinated body *in toto*, and exposed the frontal sinus about a month ago, doing a submucous operation because the nose was very narrow.

SYPHILIS OF THE NOSE.

He reported the case of a woman who had lost her nose by a syphilitic lesion. She came to him for a plastic operation, which it was impossible to do owing to the condition of the patient physically. The patient returned to her home, and it was advised by several that she try an artificial nose. Dr. Beck exhibited a picture and cast of the nose.

Every once in a while one was confronted with the question of whether a plastic operation should be done in these cases or not. He had tried a plastic operation in two or three such cases for the correction of this deformity, but had since abandoned it, believing that it was not worth the time when an artificial nose could be so easily secured.

A NEW DRILL.

Dr. John F. Barnhill exhibited a burr or drill which was intended to remove that portion of bone which covers the aditus and antrum, after the antrum had been opened and the radical mastoid operation performed. He had only used the instrument twice, and its great advantage was that the work could be done with it without possibility of doing any harm to the facial nerve, as at the point of the drill there was a guide which was introduced into the aditus and antrum, and the bur was then pressed against the bony partition over it.

METHOD OF REMOVING NASAL WALL OF THE ANTRUM OF HIGHMORE.

Dr. Derrick T. Vail, of Cincinnati, Ohio, said that in his endeavor to find a quick and simple method of removing the nasal wall of the antrum of Highmore, he had striven to devise a means by which he could simplify this important operation, and the result he presented in a preliminary way to the Society. He made a demonstration of his method of removing this nasal wall of the antrum of Highmore. He used an ordinary curved knife, thrusting it under the inferior turbinate into the antrum of Highmore. He said it was important to use a flat knife. Having made an opening to the antrum of Highmore, he introduced a curved saw of his own design through the opening made, and worked it obliquely (demonstrating). Having introduced it, he continued to saw, and said the only way one could saw with this instrument was in a circular or oval direction, as it was curved on the flat, and it would naturally go around to the original point of entrance. The saw worked on the principle of a keyhole saw, except it is curved or is a section of a tube with saw teeth and is always used obliquely to the antral wall, and this readily pursues an oval circumference, and one could make a smaller or larger opening, as necessary.

Dr. Vail also showed an instrument for tonsil work, which was somewhat elongated. He said the tonsil was grasped in the usual way with Ballenger's forceps, and a sharp knife was used for dissecting the tonsil out. With this instrument one could shell out the upper part of the tonsil, which was the most important part of the operation.

A NEW ASPIRATOR.

Dr. W. L. Dabney exhibited an aspirating apparatus for cleaning out the middle ear with compressed air. He said in some cases after the radical operation there was some discharge, and by means of this instrument one could empty the middle ear cavity entirely by compressed air. In the O. M. P. C. cases one could evacuate it completely if there was a small or large perforation. It took vaselin out of the bottle with a pressure of fifteen pounds from the tank.

He had always been able in the O. M. P. C. cases to establish the middle ear with Eustachian catheter, passing it through the nose and into the middle meatus. In a case a few weeks ago, he aspirated the attic and thought he had the canula in the aditus. He aspirated the pus there, and microscopic examination showed cholesterin crystals, and a radical mastoid operation demonstrated cholesteatoma.

PAPER:

INDICATIONS FOR THE SUBMUCOUS RESECTION OF THE NASAL SEPTUM.

ROBERT LEVY, M. D.

The following thoughts can hardly be dignified by the term "paper." I should prefer to class them under the heading of a "note dealing with the indications" for the above named operation. Still if one recognizes the importance in all operations for their *raison d'etre,* no term can be considered too dignified for this subject.

The question of the necessity for the performance of any operation must always be one of prime consideration, the indications being controlled by definite symptoms, which must be actually dependent upon physical and objective signs rather than upon obvious anatomical change in structure. It was many years ago that Harrison Allen, whom we will always respect as a great student of anthropology and anatomy, stated that less than 5 per cent of all human individuals possess absolutely normal noses structurally. Cases of nasal stenosis with its attendant evils are undoubtedly in many instances due to deviated septum. On the other hand, there are many cases of nasal obstruction, of which the septum, though slightly deviated to one side or the other, is less commonly the cause than are such conditions as intumescent or hypertrophic rhinitis or adenoids in the nasopharynx.

A condition which is very commonly responsible for difficult nasal respiration, reflex disturbances or nasopharyngeal discharge, is the presence of exostoses and ecchondroses from the septum. These are nearly always associated with more or less deflection, and it is frequently a nice point in judgment to determine whether a large spur or ledge alone is sufficient to produce the symptoms, or whether the deflection is sufficient to materially increase the difficulty.

In deciding the line of treatment and the character of the operation indicated, one must not only determine the nature

of the difficulty to be overcome, but must also take into consideration the effect upon the patient. Operations should be chosen, all things being equal, with a view to simplicity, the shorter the operation the less shock and discomfort to the patient.

The window resection presents the ideal method for the correction of certain deformities of the septum which no other operation has ever offered. The history of this operation is a remarkable story, and one is astonished that this procedure did not become popular many years ago. The principle upon which its performance depends has been spoken of in medical literature for many years, and it needed only a certain amount of thought upon the part of enthusiastic rhinologists to rapidly develop its value. It is also rather amusing to read the many discussions and controversies between such men as Victor Lange, Krieg, Hajek, Zarniko, Freer and others, which have appeared from time to time in *Fraenkel's Archives,* as to priority or as to some peculiar modification in technic. All of these men and many others are deserving of much laudation, but it seems a rather simple matter to be dignified by extensive discussions. Each one has added his share to the literature, to the perfection of technic, to the improvement of instrumentarium and to each one we acknowledge our indebtedness. I believe, however, that we owe to Killian the greatest debt of gratitude for having in fullest detail called to our attention the value of this procedure. I should, however, hesitate to name this operation Killian's or call it by the name of any other individual. Few men have given us anything but method of operation, while Killian's article published in the *Archiv,* 1904, describes extensively the indications and contra-indications, in addition to many other important subjects, including operative technic.

The attractiveness of this operation to the rhinologist is that it is a surgical procedure of the greatest nicety and delicacy. It has none of the elements of mutilation that other operations have, nor is it the simple incision of a structure which so frequently characterizes rhinologic operations. On this account patients have frequently been subjected to it when other and simpler remedies might have answered the purpose better. Freer (*Journal of the American Medical Association,* December 5, 1903) reports in fifty-one cases, only three in which exostoses and ecchondroses existed. A large pro-

portion of my cases in which slight or marked deflection of the septum existed have shown spines or ledges of decided thickness which were readily removed by the simple sawing operation. Long before submucous resection of the septum was practiced to the extent that it is today, innumerable cases of spurs or spines were sawed off, resulting in completely satisfactory results. In my own cases, it was not difficult to determine the thickness of the septum and thus avoid perforations. It was only those instances in which the septal ledge complicated a marked deflection that the results were unsatisfactory. In all cases in which the deflection is slight, while the exostoses and the ecchondroses are large, I still operate with the saw. The healing may at times be somewhat prolonged, but with ordinary care in after-treatment, the mucous membrane is restored over the wounded surface, and, notwithstanding theory to the contrary, there usually results a normal functionating mucous surface over the site of the operation. A class of cases which cause much annoyance are those attended with intumescence or hypertrophy of the turbinals. It is often a nice point to determine whether a portion of the turbinate shall be removed or not. Given a moderate deflection of the septum, I prefer to remove this first before interfering with the important respiratory function of the nose as determined by the turbinate bodies, however, I recall two instances in which the result of the septal operation was nil. It became necessary in order to restore the patient to fairly good nasal respiration to remove a portion of the turbinate afterwards. Whether the alteration in the turbinate bodies as indicated by intumescence or hypertrophy is the result of septal deviations, is to my mind a question which has not yet been definitely determined, nor does it always follow that the removal of a portion of the inferior turbinate when indicated, results in any harm. Here again I should urge careful weighing of the problem before operating upon the septum and the turbinate afterwards. One operation, the removal of a small portion of the hypertrophied turbinal tissue, will often suffice.

In the National Jewish Hospital for Consumptives, situated at Denver, I have seen frequent examples of the beneficial effect of establishing free nasal respiration. Patients with tuberculosis demand much attention to the upper respiratory tract, and often in moderately advanced cases of tuberculosis

the establishment of free nasal respiration and the removal of irritating discharges from the nose and naso-pharynx, prove an important factor in bringing about general improvement. A moderate deflection of the septum is of less importance in the production of Eustachian tube catarrh than a posterior turbinate hypertrophy or naso-pharyngeal adenoids. The indications are to correct the turbinal or naso-pharyngeal trouble rather than the slight septal deflection. In the production of reflex neuroses, including ocular troubles, sharp posterior spurs pressing upon the middle turbinate or upon the opposite inferior turbinate are of more importance than a moderate coexisting anterior deflection. It is a fairly simple procedure to remove these spines, and the result will be entirely satisfactory.

A contraindication to all operations upon the nasal septum which, in my opinion, is of great importance, is the existence of syphilis, either hereditary or acquired. There is no structure which breaks down more readily in a syphilitic individual than cartilage. This is illustrated by the frequent nasal deformities that we find as a result of this affection in the nose. Under no circumstances should one perform an operation for the correction of a septal deflection in a patient suffering from lues until he has definitely satisfied himself that the patient has been under sufficient treatment to avoid a destructive process following. Lack of attention to this detail will in all likelihood result in an unsightly nasal deformity.

In conclusion, I do not wish to detract from the importance and the immense value that the submucous resection of the nasal septum offers us. It is the most ideal operation for deflected septum. It is, however, an operation requiring a decided perfection of manual dexterity and perfect technic. It is also an operation requiring rather more endurance and consequently producing somewhat more shock on the part of the patient, therefore, I desire to reiterate that before deciding upon its performance it is incumbent upon us to carefully weigh the symptoms and to exercise the nicest of judgment so that it can not be charged against us, as so frequently has been charged in the past, that rhinologists operate because of some simple anatomical abnormality, rather than because of definite disturbing symptoms.

DISCUSSION.

Dr. Joseph C. Beck referred to the indications and contra-indications of the operation. He had done this operation in several instances, but there was no evidence of any sinking-in of the nose. He had heard, however, of some cases in Chicago in which there was some sinking-in of the nose where too vigorous removal of the cartilaginous septum too close to the anterior part of the nose was made.

He asked the essayist, in his closing remarks, to indicate the location of the incision for some of the deflections.

Dr. Wilbur B. Bullette said he knew very little about the operation from a practical standpoint, from the fact that he had not performed it, and therefore he could not talk intelligently about it. The reason he had not done the operation was because he had not provided himself with the necessary instruments, and because he did not consider the proper case had been presented at his office for that operation. He had, however, during the past fourteen months, done twelve Gleason-Watson operations, with good results. While he was not from Missouri, yet he was willing to be shown, and he believed what he had seen in Chicago convinced him, in addition to the literature, that it was a most valuable operation, and that it would revolutionize the treatment of the cases under discussion. He did not understand how it was that healing was obtained by first intention after this operation, and why it was men went on and consumed so much time in performing the operation, when the Gleason-Watson operation could be done in three minutes. He had done it himself in three minutes. He had provided himself with the necessary instruments, and when a suitable case presented itself, he would operate by this method.

Dr. C. S. Means, of Columbus, Ohio, called attention to a condition which had come under his observation, and which he described as football septum. It was a thick split septum. It was found in athletes or boys who played football, one-half of these players having septa from a quarter to half an inch thick, almost occluding the entire nares. The turbinates were all right. There was no perceptible deviation. He wanted to know if others had seen such a condition.

Dr. Derrick T. Vail had seen two such cases in one day in

which the cartilage was separated, the patients having the same condition as that described.

Dr. Hanau W. Loeb thought Dr. Levy's paper was very timely. In these days, when the submucous operation was getting to be so easy of performance, and the technic was being greatly developed, the temptation was great to take off a little bit of a curved septum in the hope that it might do some good, when really, after all, another operation was more advisable. He thought it was quite timely to call the attention of laryngologists all over the country to that fact, that there were still other operations to be done besides the submucous operation, although the temptation to modify the original submucous operation was exceedingly great, and he thought this paper ought to stimulate the members to remember other operations.

Dr. E. Fletcher Ingals expressed himself as being heartily in sympathy with a large part of the paper. He felt with the last speaker, however, that there were so many opportunities for removing the septum submucously, that there was a great temptation to do so when it was not perhaps necessary. If there was a small spur, or if the septum was not bent sufficiently far to cause perforation, even if the spur was large, removal by a saw was much easier for the operator, and better than the submucous operation. The mucous membrane could be severed from the upper part of the spur, and lower part just as well without submucous resection as with it. When an opening was made there and the spur was sawed off, the submucous operation was admirable, but it seemed to him, as he judged it did to the author of the paper, that there were a great many operations of this character performed which could be much more easily done for the patient and for the physician in some other way.

There was one suggestion in the paper that he did not quite agree with; perhaps he did not fully understand the author. His idea was that when there was a small spur he (the essayist) would recommend removing it altogether rather than removing a part of the turbinated body. The speaker would do neither. He would neither remove a small spur nor part of the turbinate to reduce the turbinated body, without the removal of any part of it, or at least no more than was abnormal so that he would leave the full amount of tissue for performing the function, leaving a small spur, provided the patient had sufficient room for nasal respiration. It had been

shown that fully fifty per cent of the Caucasians had spurs of some sort. These little spurs did not prevent patients from having free nasal respiration, and unless the turbinate was swollen they ought to be left alone.

Dr. Edwin Pynchon said that among the most stubborn cases the rhinologist had to treat, and among the most difficult, were those which were called the congenitally narrow nose cases in which the septum was perfectly plumb and straight. In some the nostril was narrow, owing to the head being narrow; the septum was abnormally thick, but in case the patient's head was wide enough, the outer walls of the nostrils far enough apart, the septum was so thick that there was not left proper space on either side for the physiologic swelling of the turbinals, and hence the patient was troubled with nasal catarrh. He listened to the essayist to see if he had mentioned this condition, and had suggested the submucous resection operation as being the only treatment for the correction of that condition, but it had not been touched in any of the writings known to him. It was one of the great fields for the submucous resection operation, and one of the strongest calls for it was to remove the cartilage from the septum, which was abnormally thick, which could not be otherwise corrected without doing four turbinotomies. The indication was to correct conditions of this kind by doing the least possible amount of injury to the mucous membrane. This condition was different from that alluded to by Dr. Means, where the septum was cracked by football.

Dr. William L. Ballenger said there were indications for and contraindications against the submucous resection operation. He knew from actual experience that there were contraindications. Where there were no contraindications, the submucous resection operation was all that could be desired; that is, the operation, when suitable, was the best one that could be performed. As the essayist had said, it was one of the most beautiful, technical pieces of surgery which it was our privilege to perform. There was real pleasure in the successful performance of the submucous resection of the septum. There were cases in which it was better to do the Asch and Gleason operations, or sawing off spurs, and the other operations that had been in vogue. One contraindication was when the septum was deflected to one side and found to be adherent to the outer wall of the nose. In two such cases he had to do

a submucous resection by elevating the membrane on the free side, hoping he could lift away the cartilage and the perpendicular plate of the ethmoid, and remove a ridge without elevating the membrane on the opposite side. This he found practically impossible to do in both instances. It might be done, but certainly it was exceedingly difficult, and, therefore, he should say that in the hands of the average operator, where the septum was deflected so as to touch the opposite wall of the nose and was adherent to it, it would be a piece of daring on his part to undertake to do the operation.

Another caution as to the operation was the so-called football nose or traumatic deviation of the septum, which was followed by perichondritis. At the time of the traumatism there was usually either an abrasion or a compound fracture of the septum; infection took place, and the perichondrium and the cartilage became infected, and the cartilage was dissolved away. In one such case upon which he operated, without taking into account the fact that there had been perichondritis, there had been a slight sinking-in of the nose. In this case, there was sinking of the septum because there had been perichondritis preceding the operation and softening of the cartilage in consequence. It would be well, therefore, to make a careful examination of the bridge of the nose before undertaking the operation, and see if there was tissue firm enough to hold up the ridge. He had no doubt that this case could be corrected with paraffin injections. Such cases should be studied very carefully.

Another type in which he had found it practically impossible to do the submucous resection operation with any degree of success was where there had been perichondritis, not as the result of injury, but in connection with chronic suppuration of the sinuses. He had encountered one such case, and the peculiarities were a slightly nodular surface; there were small nodules all over the septum, and he inferred there had been perichondritis in the case, although he was not absolutely sure. Possibly there had been a chronic perichondritis and gradual, but uneven, absorption of the cartilage. He found the mucous membrane very thin and friable, and it was exceedingly difficult to elevate it. It was very adherent, and, while he had succeeded in getting a fair result, he should hesitate to undertake such a case by the submucous method. He preferred in that case to saw off the ridge and let it go at that.

One type of septum that impressed him as being adapted to the submucous resection operation was where there was a long ridge present, extending from the lower part anteriorly and posteriorly along the upper margin of the vomer, and where there was a bowing of the septum upon the opposite side in the perpendicular plate of the ethmoid and cartilage anteriorly, on a level with the middle turbinated body. The bowing was of such a degree that it touched the turbinated body. The submucous resection operation was peculiarly adapted to such cases. At a single operation one could remove the ridge on one side and remove at the same time the upper bowing, which obstructed the upper portion of the nasal chamber. He would take out a portion of the triangular cartilage, and then remove the perpendicular plate of the ethmoid with the Ballenger-Foster forceps or with some other instrument. One would find in elevating the membrane over the convexity that the middle turbinate could be pushed out of the way. By pushing the forceps in submucously (after elevation), the turbinate would swing out of the way. One was thus able to take away the perpendicular plate of the ethmoid and cartilage of the septum. He could remove the upper bowing of the septum and relieve the obstruction in the superior meatus, removing, at the same time, the ridge in the lower part of the septum. Rhinologists had been forgetting the upper bowing of the septum because there was no operation which would afford relief except the removal of the middle turbinate itself. With the submucous method of operating we could remove the bowing of the septum very easily. It was more important in many cases to establish drainage and aeration of the superior meatus, into which empty the posterior ethmoidal and sphenoidal sinuses, than to open the lower meatus which was obstructed by the ridge.

Dr. R. B. Canfield suggested in connection with the question raised of performing the submucous resection operation in which there were adhesions between the septum and turbinates, that the operation be performed, if possible, without loosening the mucous membrane in its attachment to the side of the nose, and, having done this, without perforating the concave side, sacrifice the mucous membrane that was attached to the side of the nose. This left the septum with one layer of mucous membrane. He had seen a couple of football noses in Ann Arbor without any perforation.

Dr. Levy, in closing the discussion, said that his real incentive to write the paper was because he had seen so many cases in consultation in which he considered the operation was not indicated. He said that football noses had been alluded to in a paper by Dr. Freer, who spoke of cases in which the septum was thick on both sides, and in which submucous resection had been resorted to.

As to the removal of small spurs, he did not recommend it, because they were producing no nasal obstruction. The indications for the removal of spurs of small size were not that they produced nasal stenosis, but that they produced pressure. A small, though sharp, spur on the posterior part of the septum, pressing upon the middle turbinate or inferior turbinate, was the cause of certain neuroses—headaches and other neuroses—and interfered with posterior drainage. These were the indications for the removal of septal spurs, and not because they produced stenosis.

He said he should be disappointed if he conveyed the impression that he was in favor of turbinotomies, as he had been a strong opponent to meddling with the turbinates unless it was necessary. He had never intentionally removed a turbinate completely. He had removed small portions of the turbinate. Rather than remove too much tissue, he would do a partial turbinotomy, and remove more at a second time if necessary. He considered turbinates too important to meddle with to any extent.

In regard to correcting by the submucous resection operation extensive deflection, with adhesion of the outer nasal wall, his experience had been sad to this extent: He attempted to do an operation in which the septum was deflected to the left, with a large spur upon it, and extreme adhesions to the external wall of the nose. He gave the patient good nasal respiration, relieved the stenosis, gave him a straight septum (as much of the septum as was left), but had a large perforation which did not, however, do the patient any particular harm.

PAPER:

THE TREATMENT OF HYPERTROPHIC AND INTUMESCENT RHINITIS.

By E. Fletcher Ingals, M. D., and Stanton A. Friedberg, M. D.,

The treatment of chronic rhinitis of the hypertrophic and intumescent forms is a subject that has been frequently discussed. Nevertheless, it possesses sufficient interest to warrant one in making a clinical study of a definite number of cases in order to ascertain just what results have been obtained from a particular line of treatment. A detailed study of the results of cauterization with the galvano-cautery in these cases has only confirmed us in the belief that this operation, when properly performed, offers the most satisfactory method in the treatment of these conditions.

The use of the galvano-cautery in the treatment of the ordinary forms of so-called nasal catarrh, has to some degree given way to the snare, scissors, or the local application of medical agents. Some rhinologists have condemned it on account of a supposed liability in causing ear complications. For various additional reasons, others have laid it aside. Probably some of the same factors that entered into bringing into disrepute chemical cauterizations, have affected similarly galvano-cauterizations, although a comparison of the two methods, in our opinion, shows that the latter is more easily controlled and produces more lasting results, without destroying large areas of mucous membrane. Not only can a greater length of the turbinal body be safely cauterized at one sitting, but the cauterization can be made deeper and more effective and can be accurately limited to the region desired. The snare and scissors without question have their place in the treatment of these nasal conditions, but the indication for their use is less frequent. Naturally where the hypertrophy is of great extent or confined to the posterior ends of the turbinals, these would be the instruments of selec-

tion. In the intumescent forms of the disease, the galvano-cautery is superior, as it destroys only a small part of the turbinal tissue, and as the wound heals a contraction down to the bone is brought about which prevents subsequent swelling. It is easy to remove too much tissue and bring on an apparent atrophic condition, as may be done with a too free use of the snare. The use of local remedies, such as astringents, while sometimes affording temporary relief, have not impressed us with the permanancy of their results.

In order to show the value of the galvano-cautery, in the usual cases of catarrh, one hundred consecutive records, in which treatment had been carried sufficiently far to serve as a basis for comparison, were taken, comprising fifty of the hypertrophic form and fifty of the intumescent. The records were of patients, the majority of whom were first seen from three to five years ago. This was done in order to be sure that sufficient time had elapsed from the beginning and end of treatment to obviate any doubt as to the permanancy of the results. No case in which there had been less than two cauterizations was taken, although not infrequently patients experience relief from one operation, yet many for various reasons do not return for further treatment.

In a careful study of the 100 cases, the causes of complaint were found to be exceedingly variable, but in the main, the symptoms for which treatment was instituted ranged from a feeling of stuffiness in the nose, stopping up or occlusion of one side alternately with the other, or of both sides at the same time, to permanent obstruction complete or incomplete of one or both sides. Along with these conditions were sensations of dryness in the nose, pain usually referred to the root of the nose, dropping back of mucus into the nasopharynx, or excess of secretion in the nose without any discoverable indication of sinus disease. Headaches, impairment of the sense of smell, sneezing and a history of catching cold easily were also noted as troublesome symptoms. Gastro-intestinal disturbances were present in some instances. Some also presented certain symptoms referable to an associated catarrhal condition of the ears, such as a sense of fullness, tinnitus and more or less loss of hearing. Symptoms of pharyngitis or laryngitis were noted in a considerable number of cases, due to a transient or persistent habit of mouth-breathing.

The duration of the nasal affection was variously stated.

Some patients give a history of having been troubled always, the shortest time was three weeks. The greater number had been affected from one to six years.

The nasal conditions for which cauterizations were undertaken have varied from an obstruction of approximately one-fourth the lumen of the naris to complete closure of the same, embracing, of course, the simple intumescent or intermittent forms and those of the chronic or hypertrophic form, circumscribed or general, with partial or complete permanent obstruction. In many instances definite statements were given by the patients as to the ability or inability to breathe freely through the nose, in whom at the time of the examination the reverse conditions were present.

In a number of cases, exostoses of greater or less degree were present, necessitating removal before an entirely satisfactory result could be obtained; but in the majority, the results were satisfactory without any septal operation. We never recommend this operation unless sure that the condition of the septum causes decided obstruction to nasal respiration. Where the hypertrophy of the posterior end of the turbinal body was great, the snare was employed.

In the hypertrophic form one or the other side was free at the first examination in fourteen cases. Swelling was found on only one side in twelve instances, but both sides were involved in 33 of this series.

In the intumescent form, at the first examination, one or the other side was free in 18 and both sides in 3 cases. Swelling was present on only one side in 28 and in both nares in 15 of the patients.

The inferior turbinal bones were enlarged in two, and the posterior ends of the turbinal bodies were considerably enlarged in four cases.

Exostoses of the septum were noted in one or the other side in the hypertrophic form in 20 cases. Swelling of the septum occurred in both sides three times and in either side alone, eight times. Simple deflection was found in one case and deflection and exostoses in four.

In the intumescent form exostoses were present in one side 19 times and in both sides 3 times. Swelling of the septum occurred on both sides 3 times, in one side 3 times. Deflection occurred twice and deflection and exostosis the same number of times. Out of the 100 cases the septum was involved in

51, exclusive of those in which merely swelling was noted. Adhesions and perforation were each found once.

The middle turbinal showed changes such as hypertrophy, swelling or polypoid degeneration in only 17 instances and these changes were confined to one side. Polypi were found in five cases. Submucous thickening at the sides and base of the vomer was noted six times. Hyperesthesia was found three times and in four cases the mucous membrane was noted as paler than normal.

METHOD OF CAUTERIZATION.

The first step in preparing the naris for cauterization is the removal of any secretion that may be present, after which the turbinal body is anesthetised with a four per cent solution of cocain, containing in addition, the following ingredients: Atropin gr. 1-10, strophanthin gr. 1-5, ol. caryophyli M. iii, acid carbolic grs. x to aqúa dest. oz. 1 and methylene blue, sufficient to color the solution a light blue. This solution is applied by means of a cotton-wound flat applicator which is slowly rubbed backward and forward along the entire length of the turbinal, for from 20 to 30 seconds. From three to five such applications are ordinarily necessary to complete the anesthesia. In a few instances where a 4 per cent solution is not strong enough to produce anesthesia, a stronger solution must be used. Constitutional symptoms from the use of this 4 per cent solution are extremely rare. Where a patient has an idiosyncrasy to cocain, eucain or alypin is used.

The knife-like electrode is introduced and a linear cauterization is made extending the whole length of the inferior turbinate body, usually at the junction of the upper with the middle third, or of the middle with the lower third of the body. In an occasional case where the reaction from the cauterization has been too great, only one-third or one-half of a complete line is made at subsequent sittings. Following the cauterization an application of compound tincture of benzoin with an excess of two ounces of benzoin to each ounce of powder of iodol is applied to the burnt line, followed by a mild oily spray. This seems to lessen the chance of infection and also lessens the reaction from cauterization. The patient is given an oily spray and a powder for home use and is directed to wear a pledget of cotton in the nostrils when out of doors for four

or five days. He is told to return at the end of this time and a probe is passed between the turbinal body and septum in order to prevent an adhesion taking place. If everything is going well, he is then told to return in from ten days to two weeks, when another cauterization will be made upon the opposite side. Much discomfort is apt to be caused if a second cauterization is made before at least ten or twelve days have elapsed. In this time the nose, while not entirely healed, has recovered sufficiently to permit of a second operation.

In cauterizing the middle turbinal or septum, only short lines are made each time.

Altogether 295 cauterizations were made, 149 in the hypertrophic and 146 in the intumescent variety. The right inferior turbinal was cauterized 137 times, the left 143, the right side of the septum 12, the left once, and the right middle turbinal only two times.

It was necessary in 25 of the cases to perform other operations; which were 27 in number, viz., exostosis removed in 11, polypi in 4, adhesions cut in 2, resection of septum in 2, burr or trephine through turbinal bone in 5 cases, posterior ends snared off in 3 and tonsils removed in 1; of these 25 cases, nine had undergone some previous operation. In addition to these nine, ten more cases of the series had been operated previously. These operations consisted of removal of tonsils in five, of Luschka's tonsils in three, cauterizations in nine, removal of polypi in three, resection of septum in one, removal of spur in one and of part of turbinal in one. Several of these operations were combined in some of the cases.

Of complications or unfavorable conditions following the operation, bleeding was noted in seven instances. In no one of these cases, however, was it of any great importance, as it was not necessary to adopt any measures such as packing to stop the flow of blood. Attention is called to this merely to show that if sufficient care is used in having the electrode at the proper heat, bleeding can practically always be prevented. Only in those cases in which the wire is at too white a heat is there liable to be any trouble from this source. Adhesions were noted in five cases, but they were usually readily broken down by the use of a probe; this was sometimes followed by the application of a mild solution of silver nitrate.

When caution is used to avoid wounding the mucous membrane of the septum opposite to the point of cauterization and

when the patient is seen again in four or five days, the liability to adhesion-formation is greatly diminished.

The use of a spray in the home treatment caused some trouble in seven instances. These patients complained of soreness of the nostril, sneezing, dryness, increased discharge or nausea. Headache, pain in the nose, or neuralgia, were complained of in a few cases following the cauterization. Several of these patients, on returning, spoke of having caught cold with the attendant symptoms of an acute rhinitis, a condition that should be anticipated after most intranasal operations. Tonsillitis occurred within one day after the cauterization in one case. Increased secretion was noted a few times, as was also a feeling of dryness in the nose. In one case the burnt area healed very slowly. Complete healing of the catarrhal condition, as a rule, takes place in from four to six weeks after the cauterizations have been completed, and after this time there is but rarely any complaint as to dryness, crusting or scabbing in the nose.

In no instance was there any aural disturbance or complication attributable to the cauterization, although we have observed such a complication in one instance in several thousand operations.

The shortest period of treatment was eight days; the longest was for two years. However, in this latter case the treatment was frequently interrupted for months at a time. Fourteen were treated for less than twenty-four days, sixty-three were treated for from one to six months, seventeen from this time up to one year, and seven over a year. However, it should be stated that in a considerable number of cases in which the treatment was prolonged, the patients were from out of the city and consequently the treatment was not continuous, it being largely a matter of convenience to the patient when he would return. Of the sixty-three who were under treatment from one to six months, the greater part were under care from one to three months. The average number of consultations in this latter division was about six.

In the average uncomplicated cases of hypertrophic or intumescent rhinitis, eight to ten weeks, with six to ten consultations all told, should be sufficient to effect a cure. Relief, however, may be obtained in less time, most patients noticing this in but a few days after the first cauterization.

The time elapsing between cauterizations varied greatly; this

extended from eight days to 13½ months. No case was cauterized the second time before eight days had elapsed since the previous cauterization. The second cauterization was not made until after an interval of three months in sixteen cases. The greater majority of succeeding cauterizations were noted in from eight days to one month. More cauterizations took place after a lapse of fourteen days, than upon the lapse of any other period of time.

A second cauterization is rarely made before ten days have passed since the former one and it is only made then when some special exigency requires. Experience has shown that it is better to wait about fourteen days before undertaking another operation. While the nose is not entirely healed even at this time, it has so far recovered as not to cause the patient any serious inconvenience because the succeeding operation is made in the opposite naris. In some instances, especially when the general health is not up to the normal standard and when consequently the wound heals slowly, it is better to wait a longer time.

The results of treatment in the hypertrophic form of rhinitis were, in eighteen cases, excellent, improved in nineteen, partial improvement in seven, not improved in one, and no information obtained in five. In the intumescent form the results were excellent in twenty-seven, improvement in thirteen, partial improvement in three, no improvement in one and not stated in six. It is only fair to state that in most of the cases in which the results are given as not improved or partially improved, the treatment was unfinished. In like manner, with those in whom no statement of condition was found in the records, it is reasonably certain that the majority of them obtained relief.

Adding the results obtained in both series, we have seventy-seven cases in which the results were excellent or much benefited, ten in which partial improvement was found, two in which there was not improvement and eleven cases in which there was no statement as to improvement or lack of improvement, and of these eleven, in eight, the treatment was of less than one month's duration and was unfinished.

In is interesting to note that three cases of asthma were found in this list which were treated locally and with internal remedies. The asthma, although the nasal trouble was relieved, failed to improve in two. In one case, with the improvement in the nose, relief was secured from the asthma.

Mouth-breathing persisted in two cases, although the nose was freed of obstruction. This was probably due largely to force of habit.

CONCLUSIONS.

1. The galvano-cautery when properly used offers one of the best, if not the best, methods for the treatment of the intumescent and hypertrophic form of rhinitis.

2. The dangers of middle-ear infection have been greatly exaggerated, not any case in the series and only one among several thousand cauterizations, having come under our observation.

3. The liability to adhesion-formation is not great, providing sufficient care is taken not to injure the opposite septal mucous membrane; and providing in cases in which the subsequent swelling is marked, a probe be passed between the opposing surfaces in four or five days.

4. A 4 per cent solution of cocain, according to the formula published, is sufficient in the vast majority of cases to induce complete local anesthesia, three to six applications on a cotton-wound flat applicator being sufficient for the purpose. As a result of experience, especially in cases of marked intumescence, we believe that a spray of adrenalin or suprarenalin gr. ⅛ to the ounce materially assists in producing anesthesia.

5. The objection that the galvano-cautery destroys too much of the mucous membrane, does not obtain if the cauterization is linear, as here recommended, and if it is done properly, whereby very little mucous membrane is destroyed..

6. Scab and crust formation does not occur any oftener following cauterization than after other nasal operations. In fact, it was noted in but very few instances and in some of these a change in the spray solution caused a cessation of this trouble.

7. No packing is needed to prevent hemorrhage and this factor makes the discomfort following the operation very much less than after some other methods.

8. There is very little pain after galvano-cauterization of the turbinated bodies.

DISCUSSION.

Dr. Willis S. Anderson thought the essayist had overestimated the value of the galvano-cautery as compared with

other methods. Personally, he had grown to feel that we had other methods that perhaps were just as effective or even better than the galvano-cautery. If the galvano-cautery had any place in the nose, it was in the intumescent variety of rhinitis, but even in this condition we had just as good methods. In the hypertrophied conditions it seemed to the speaker that we had better surgical methods. He preferred making a little incision along the lower border of the hypertrophy, making a small flap with a sharp pair of scissors, cutting out a wedge-shape piece, and dropping the flap back, taking two or three days until union took place, and, to his mind, this is a more accurate way of relieving these conditions than by the cautery. In the intumescent variety, if the case is not a bad one, the introduction of a cataract knife under the mucous membrane, and drawing the sharp edge of the knife along the bone will be followed by contraction without injury to the epithelial surface of the membrane except where the point of the knife went in.

On the middle turbinal he had rather grown to feel that the cautery should not be used at all. In some cases a number of years ago he had very marked reaction, and it seemed to him that in the use of the cautery on the middle turbinal we were apt to have a severe reaction if the ethmoid cells were in any way diseased. If the ethmoid cells were healthy, we did not have as much reaction. If they were diseased, the reaction from the cautery was very marked. He made a plea for the use of a cleaner and nicer method of incision with a flap in removing tissue rather than the use of the cautery.

For posterior hypertrophies, he thought the snare was the preferable instrument, although he had sometimes found some difficulty in catching these hypertrophies with a snare, and then he was forced to use the cautery.

Dr. M. A. Goldstein said the paper was timely, and, like history in the world at large, repeating itself, so, too, in the world of laryngology there was always a crisis following some good and rational measure. This crisis was the result of the overdoing of a condition, a technic which had been developed to its full extent. This might be said perhaps of the radical operation on the mastoid. It might be said of extensive operation for sinusitis as it was done abroad. It might be said in a few years of the submucous resection of the septum; it was now being said of the galvano-cautery as a technic for the

reduction of hypertrophies and intumescence of the turbinals. After everything had been said, however, it still remained as a rational, clean, simple, technical procedure for the reduction of turbinal turgescence and hypertrophy, and with the results obtained by linear cicatrization along the length of the turbinal, if the cauterization with the galvano-cautery was made deep enough to engage the periosteum, the results, where especially the hypertrophies were not too intensely or markedly developed, were universally satisfactory. He said that Dr. Pierce some years ago suggested another method of producing such cicatrization submucously, namely, submucous cauterization by means of chromic acid. The speaker modified this some time later by using a trocar, plunging the trocar into the hypertrophied mass close to the bone. The chromic acid bead was introduced into the canal like opening thus made, in that way producing, as Dr. Anderson had suggested, cicatrization close to the bone and reducing the caliber of the nostril. Whatever the technic may be suggested, the result that we attempted to obtain was the same, namely, that of cicatrization of the soft tissues against the bone. If this result could be obtained in the simplest possible form, this technic was still most acceptable, and no doubt the galvano-cautery, in the majority of cases where the hypertrophies were not too aggravated, where intumescence still existed, deep linear cicatrization was satisfactory, and was a much more simple technic than dissecting a wedge-shaped piece from the turbinal and dropping down a flap of mucous membrane and going through the after-treatment for hemorrhage, infection, and other complications which might arise from any complicated form of technic.

Dr. Edwin Pynchon said he had been gradually drifting away from the use of the cautery in the nose. He had not used it on the inferior turbinate in a year, and got along all right without it. He used the hot snare for the posterior ends of the turbinate. He said we should stop to think what the cause is. First, hyperemia; next, inflammation, and, eventually, possibly actual hypertrophy of the turbinals. It is the stoppage of the upper part of the nose, and, therefore, breathing through the inferior or lower part of the nose, which induces these steps—hyperemia, intumescence, and possibly hypertrophy. The point to remember was the physiological function of the nose, and to take such steps as would allow air to pass through all parts of the nostril, and he had rather

drifted towards operations upon the anterior end of the middle turbinate, which permitted one to go through the attic of the nose, and correct the condition of post-nasal catarrh, which was so frequently present.

As to cauterization of the inferior turbinal, if the cause was not removed, there was generally a history of recurrence. If instead of cauterizing the inferior turbinal we attacked the deformity of the septum and the hypertrophied conditions of the bony part of the middle turbinal, the anterior end particularly, we would do away with the necessity of cauterizing so much. He cauterized soft growths of the septum; otherwise he rarely used the cautery any more in the nose.

Dr. Hanau W. Loeb thought it was wise that the practice of cauterizing indiscriminately the various tissues of the nose had been given up. There were many conditions, however, in which it was of service. He did not think any one would claim (not even Dr. Ingals) that where we had a large pendulous hypertrophy of the inferior turbinate filling the inferior meatus and interfering with drainage, cauterization could be expected to do any good. In such a case, excision was of the greatest value, leaving behind as much turbinal tissue as under normal circumstances would be there. To him the indication was plain that where the inferior turbinate was more or less uniformly enlarged, without any portion of it being pendulous, the electro-cautery would do some good. It was his practice to repeat the operation if necessary. There were cases in which it was not necessary to remove a spur or turbinate. Patients came to him with Bright's disease or other conditions perhaps; they were seventy-five or eighty years of age; they had an hypertrophied condition of the turbinate, and if one was considerate as to the welfare of such a patient, he would not subject him to any considerable operation. A little cauterization in the pendulous form did good. Where a patient was well and did not want to submit to a more radical operation, and where the turbinate alone was more or less uniformly enlarged, without any pendulous portion, the electro-cautery was of service, and should be used. ,

Dr. L. C. Cline believed the cautery had its place. Where there was an hypertrophied condition of the turbinates, it must be removed in some way. He had used the cautery a great deal, but not as much as he used to. He had never experienced any serious trouble from its use, althought he kept away

from the healthy membrane, he used it on the hypertrophic mass or by puncturing and shrinking the hypertrophy in that way.

The speaker had encountered lithemic cases which were greatly helped by suitable internal medication; they would fade away like a gummatous or luetic condition, provided the exact condition of the patient was determined and the patient treated as one would treat intestinal difficulties by regulating the diet, adopting hygienic measures, etc. Many of the cases he came in contact with were those of a lithemic character. He believed these people ate too much.

Dr. William L. Ballenger stated that on one or two occasions this subject had been brought before the national medical associations which he had attended, and the custom of cauterizing the nose had been almost universally condemned and regarded by some as an obsolete procedure. In each instance he had protested against the abandonment of the cautery in the intumescent variety of rhinitis, and he arose again to say that he believed one of the cleanest and best methods of reducing an intumescent condition of the inferior turbinated body, except its posterior portion, was by superficial linear cauterizations.

As to the methods of cauterization, he had never cauterized the entire length of the inferior turbinated body at one sitting. He was under the impression that to do so would invite adhesions and excessive inflammatory reaction. He could not speak, however, from experience in this regard. He could, however, speak from observation, because he had seen many cases that had been cauterized by others in which there was a tremendous reaction and adhesive processes, and hence he had never cauterized more than one-third the length of the inferior turbinated body at one sitting, and in from five to seven days he cauterized the opposite side, and at an interval of another week he cauterized the middle portion of the first turbinate, and so on until he had completed the entire length in six sittings. This had been his practice for nearly eighteen years, and he did not now recall a case in which there was excessive reaction, nor did he recall a case in which he had adhesions. He believed this was a clean method, because when one cauterized properly he would leave a film of burnt tissue over the wound which was a good protective wall for the new granulations that were springing up beneath. He had no objection to the method mentioned by Dr. Anderson of ex-

cising a V-shaped piece from the mucous membrane; but he had tried a similar method, namely, that of McDonald, who incises the entire length of the inferior turbinated body, making two parallel incisions at one sitting. McDonald goes through mucous membrane and periosteum, with moderate hemorrhage. There might in some cases be profuse bleeding for several minutes, but this soon ceased, and there was practically no reaction. He had used this method many times, with excellent results; just as good as he obtained with superficial linear cauterizations. He emphasized the word superficial, because in the intumescent variety of rhinitis he never practiced deep cauterization unless it was in the form of puncture, getting the cushion effect by puncturing at different points. He did not use the cautery for the hypertrophied variety. The results had been satisfactory, in that some patients had gone from two to five years without further operation. The results were not permanent, as a rule, but he knew that in many cases the intumescence returned at the end of from two to five years. This he had observed. Many of his cases he had not seen since, and did not know what the results had been. The septum should be corrected if deformed so as to prevent the recurrence of the turgescence.

Dr. Henry Gradle mentioned a method for removing either a slice of mucous membrane in the hypertrophied variety of rhinitis, or a greater or thinner slice of bone, be it covered with hypertrophy or intumescent membrane, by means of a trephine or drill. After the removal of such a piece, it must increase the capacity of the nose to a satisfactory extent, or the operation was useless. Given a sufficiently projecting inferior turbinate, which was straight or curved, the excision of a certain strip of it was necessarily bound to increase the breathing capacity. He used an electric drill, with cylindrical grooves, placed in such a position as to hug the projecting ledge of the inferior turbinate; after it was well in place he removed the mirror, connected the drill, ran it through, and usually a single pushing around sufficed to remove a wedge-shaped piece of mucous membrane or quite a thick slice of bone. If the bone was broad, he used the instrument a second time at a higher level, and very rarely was it necessary to use it a third time to get permanent clearance of the inferior meatus.

Dr. Ingals, in closing the discussion, said that Dr. Goldstein

had expressed his opinion exactly with reference to cutting out a wedge-shaped piece of mucous membrane. The objection to cauterizing the middle turbinate would be valid if extensive cauterizations were done. He had never seen any trouble following it. He had seen one case, however, in which cauterization of the upper part of the nasal cavity proved fatal, but it was not his case. He saw the case at the time it was cauterized, and death was reported to him afterwards. It was a dispensary patient.

As to the use of chromic acid, suggested by Dr. Goldstein, he had seen a good many patients in whom it had been used. The ordinary use of it undoubtedly gave a much broader scarification than the cautery. Chromic acid, however, in the patients in whom it had been used, had caused a great deal of pain. Perhaps some patients experienced no pain from its use. It certainly did cause pain, which was not the case with the galvano-cautery. He thought the submucous use of chromic acid would be bad.

One of the speakers spoke of the necessity of repeating cauterization sometimes within two years. He thought he was undoubtedly right about this. He had frequently told his patients that he would do what was necessary after one or two cauterizations, but as long as the nasal cavity was free he would do nothing more. He could make the cavity larger if it was too small. It was better for the patient to do what seemed desirable, and then wait, and if something was needed to be done, in two or five years, it was all right.

He was glad to hear what had been said with reference to looking after the general condition of patients. This was very important. In nearly all cases he looked after the digestive organs particularly.

Superficial linear cauterization did not appeal to him. He had done it sometimes involuntarily when his battery was not working right and he could not get the wire to cut down to the bone, and where he wanted to touch the bone at two or three places from the back to the front, in order to get a scar that would attach itself to the bone. Of the superficial cauterizations he had made, they had given more trouble than deep ones.

The use of the trephine he had practiced a good deal on the hypertrophic turbinated bodies. He would use cauteriza-

tions first, and if they did not succeed he would run a trephine through submucously. He had never seen any inconvenience from this method; he used a small trephine, running it through a couple of times. More commonly, however, he used a small bur, with which he cut out the greater portion of the turbinated bone, leaving all the mucous membrane, so that when he got through, the patient had a free nasal cavity and all the mucous membrane he had before.

PAPER:

ACUTE OSTEOMYELITIS OF THE TEMPORAL BONE, WITH A REPORT OF CASES.

W. R. Dabney, M. D.

In writing of the history of acute osteomyelitis of the cranial bones, von Bergman says as follows: "Acute osteomyelitis, called spontaneous, occurring in the long bones of children and young people, was well known for some time before it had been observed and described in the flat bones. Attention was directed to the latter by the observations of disease of the ilium and the scapulæ which had been erroneously described as periostitis of these bones. This so-called periostitis was found most extensively developed at places where the periosteum was least abundant, as, for example, when tendons were directly inserted in thick layers of spongy substance.

Although Chassaignac reported the history of a case that was undoubtedly one of acute osteomyelitis, and Jaymes collected observations on fifteen similar cases, Lannelongue was the first to offer positive evidence of the occurrence of the disease in the flat bones of the skull."

As to whether we can have an osteomyelitis of the flat bones, depends very much on what we mean by bone-marrow; if we mean simply the soft substance that is contained in the central canals of the diaphyses of the long bones, then it is impossible to have an osteomyelitis of the flat bones.

Ferguson, in his work on "Normal Histology and Microscopical Anatomy," gives the following definition of bone and bone-marrow: "Bone is a firm calcareous tissue, which is found only in the skeletal system." In the flat bones it forms a double layer of dense bony tissue between which is a narrow space, bridged across at frequent intervals and thus subdivided into a number of compartments, the marrow cavities. An Haversian system contains a small central canal which is occupied by connective tissue, marrow cells derived from the mar-

row cavity during the process of development, small blood vessels, nerve fibers and perivascular lymphatics.

Bone marrow consists of a variety of connective tissue which is rich in fat cells and blood vessels and which also contains osteogenic and hematopoietic elements, the marrow cells. According to the relative proportion of these elements, marrow is said to present two types, the yellow and the red marrow. The yellow marrow consists almost entirely of fat, with only occasional bands of true marrow tissue. The red marrow contains very little fat, but is so abundantly supplied with blood and marrow cells as to closely resemble a very vascular lymphoid tissue. The embryonic medulla of all bones contains fetal red marrow, but in later life the larger masses in the medulla of the shafts of the long bones is, in man, changed to the yellow variety. The red marrow, however, persists in the epiphyses of the long bones and in cancellous bone generally; it is especially characteristic of the marrow cavities of the ribs, vertebrae, base of the skull and sternum.

Red marrow consists of fibrous and reticular tissues which are infiltrated by marrow cells and richly supplied with small blood vessels. The smaller veins possess exceedingly thin walls; in fact, these are so delicate that it is almost impossible to determine whether or not their epithelium, as also that of the capillaries, may be occasionally absent, thus placing the blood stream in direct communication with the pulp of the bone marrow."

Bichat defines the medullary system as being the bone-marrow and its membranes. He distinguishes two species of medullary systems; the one occupies the cellular tissue at the extremities of the long bones and that of the flat and short bones; the other is found merely in the central canal of long bones. (Dunglison's Medical Dictionary.)

From the above description of the microscopical anatomy of the medullary system and bone-marrow, we can readily see how it is possible to have an osteomyelitis of the scapulae, the ribs, and the cranial bones.

As the idea of spontaneous suppuration was long ago exploded by the advent of bacteriology, we cannot account for an acute osteomyelitis in this way.

Acute osteomyelitis of the cranial bones occurs secondary to abrasions and lacerations of the scalp, to gunshot wounds of the head, to compound fractures of the skull, and last but

not least to a purulent otitis media, whether it be acute or chronic.

The infection in osteomyelitis is a hematogenous one, and the micro-organisms are either taken directly into the blood at the seat of injury or, they may be carried by the blood stream from a suppurative process situated in a far distant organ, and deposited in the bone-marrow at a point of least resistance, and give rise to the violent symptoms that are seen in an acute manifestation of this disease.

If we remember the histology of the veins of the bone-marrow we can understand how easy it is for these micro-organisms to get into the bone-marrow when they have once entered the blood stream.

The infection in the majority of these cases is due either to the streptococcus or the staphylococcus; or it may be due to the micro-organisms of the disease from which the patient is suffering at the time the osteomyelitis is manifested, such as typhoid fever and pneumonia. When the infection is of streptococcic origin the destruction of bone is rapid and metastasis is usually seen early; when due to the staphylococcus the destruction of bone is more extensive, but it does not break down so rapidly and metastasis is not seen as early as it is when the infection is of streptococcic origin.

The symptoms of an osteophlebitic pyemia that are seen in these cases are due to a septic thrombophlebitis of the small vessels of the Haversian system. These septic thrombi disintegrate and small particles become detached and are carried into the general circulation as septic emboli. These emboli are carried onward by the blood stream until they enter a capillary that is too small to admit of their further passage and they then form the nucleus for the formation of the metastatic abscesses that are developed during the course of an acute osteomyelitis.

Unless the large venous sinuses of the dura mater are involved, it is seldom that we see in these cases metastatic abscesses in the large viscera of the body, such as the lungs, the liver, the kidneys or the spleen, as the vessels of the Haversian system are so small that the septic thrombi which are formed in them become detached in minute particles which readily pass through the large capillaries of the abdominal and thoracic viscera and find lodgment in the smaller capillaries of the pleura, the peritoneum, and superficial tissues of the body;

thus we can at once comprehend the pathogenesis of pleural empyema, septic peritonitis, and superficial abscesses that are seen in these cases.

Owing to the close proximity of the cranial bones to the venous sinuses of the dura mater, an osteomyelitis of these bones is of much more serious import than when this disease occurs in the bones of the extremities.

Many authorities tell us that septic thrombosis of the sinuses of the dura mater occurs in consequence of the contiguous relationship of these sinuses to the temporal bones; if this be true, then we could not have either a septic or a non-septic thrombosis of these sinuses unless the inner table had become the seat of a destructive osteitis, either macroscopically or at least microscopically; we see cases of mastoiditis in which at the time of operation the inner table appeared to be healthy, but within a few hours we have to reoperate for a septic thrombosis of one or more of the dural sinuses that are contiguous to the temporal bone, and in many instances at this second operation we find the inner table to be in a normal condition. In a number of cases I have made microscopic examinations of chips of bone that were taken from the inner table when the sinus was being uncovered to liberate a septic thrombus, and not infrequently these chips of bone were found to be healthy.

How are these serious intracranial complications, which follow so closely the initial symptoms of an acute osteomyelitis of the temporal bones, brought about, if they do not owe their origin to the contiguous relationship of these structures? I think that this can be easily answered; there is a rich anastomosis between the vessels of the pericranium, the cranial bones and the dura mater, in fact, many of the veins of the scalp, the mastoid and the tympanic portions of the temporal bones pour their blood directly into the dural sinuses; if these veins once become the seat of septic thrombi it is easy for us to see how the sinuses of the dura mater may be thrombosed when the inner table has not been involved in the inflammatory process. We can also see how it is possible to have a primary thrombosis of the jugular bulb, when the purulent inflammation is confined to the tympanic cavity, and it is due only to the resisting forces of nature that we do not see this complication oftener when we consider the procrastinating tactics that are often adopted in the treatment of a purulent otitis media.

Macewen says "that if the inflammatory process be sufficiently acute, the small vessels of the mastoid will become thrombosed and the plugs in the mouths of these vessels will protrude into the sigmoid or other sinuses that are in proximity to the temporal bone and thus we will have the starting point for the formation of a thrombus in these sinuses." Macewen in making this statement was but voicing what is regarded today as a part of the pathology of acute osteomyelitis.

The plugs that are in the mouths of the vessels that are tributary to the sinuses of the dura mater may become detached and be carried into the general circulation; if these detached particles have been previously infected, we will have manifested the symptoms of septicemia, perhaps to a lesser degree, that are seen when a septic clot in one of the large venous sinuses disintegrates and is carried into the general circulation. On account of this fact I hesitate to give an unqualified opinion that we have to deal with a septic clot in one of the venous sinuses of the dura mater, unless the symptoms of the latter are well defined. The cases that manifest symptoms of sinus thrombosis that are operated for this condition and in which we fail to find a thrombus, may be accounted for in the manner just mentioned.

In an acute osteomyelitis the arteries as well as the veins of the Haversian system become thrombosed, the bone thus being deprived of its nutrition, breaks down rapidly, and on account of this thrombosed condition of the arteries the post-operative repair of the affected part is slow.

The subperiosteal abscesses that are seen in an acute osteomyelitis of the temporal bone are not always due to a dissecting up of the posterior membranous canal wall by pus burrowing under it, or to an escape of pus through the Ravinian notch, or in children to an escape of pus through the squamomastoid fissure; but they may be due to a septic thrombophlebitis of the vessels that pass between the periosteum and the bone, as when septic thrombi have formed in these vessels, if ulceration of their walls does not take place and infect the periosteum and cortex of the bone, the micro-organisms may by a process of diapedesis migrate through the walls of the vessels and thus infect the surrounding tissues. Any operative procedure that is adopted in a case of subperiosteal abscess that is consequent to an acute osteomyelitis, must encompass an opening of the bone, and a thorough removal of the

broken down medullary tissue, or the operation will be worse than useless, as such an operation subjects the patient to the risks of an anesthetic without eradicating the underlying pathological condition that is the etiological factor in the production of the subperiosteal abscess; furthermore, metastasis goes on which sooner or later in the majority of the cases, claims the life of the patient, or if the patient does not succumb the condition becomes chronic and he is subject to the risks and dangers of a chronic septic infection.

As the dura mater acts as an endosteum for the cranial bones, we are just as likely to have an extradural abscess as we are to have a subperiosteal abscess in an acute osteomyelitis of these bones. The pathology of these extradural abscesses is the same as that of the subperiosteal ones that have been referred to.

In my earlier operations for acute osteomyelitis of the temporal bones I made the mistake of not opening the inner table and searching for an extradural abscess, and to my chagrin I would have to open the inner table shortly after the primary operation on account of symptoms of pus retention within the cranium.

The extradural abscesses were usually found between the inner table and the sigmoid sinus, constituting what are known as perisnous extradural abscesses. The subdural abscesses were usually found above the roof of the tympanum or antrum.

The ear may or may not be discharging at the time we are called to see the patient, but we are told that the patient has had a severe chill, that was followed by a rapid rise of temperature and pulse. The pulse rate being out of proportion to the rise in temperature, as it may be from 140 to 160 per minute, while the temperature may not rise above 102° F. or 103° F. The tongue is heavily coated and the spleen becomes suddenly enlarged; the respirations are increased and embarrassed; this symptom taken in connection with the initial chill and the rapid rise of the pulse and temperature might lead one to mistake the true condition for a pneumonia.

If the true condition is not recognized early and if he does not succumb before he receives the prompt surgical treatment that is indicated in these cases, the patient becomes weakened, excitable and irascible; he loses flesh rapidly and sinks into a typhoid state; the general senses are impaired; there is mild

delirium and stupor; the abdomen is distended; the pulse is rapid, infrequent and easily compressed; the stools may assume a typhoid appearance and an eruption similar to that of typhoid fever may appear on the abdomen and thorax, but if you will examine these red spots closely you will find that they do not disappear on pressure, that they are not elevated above the surface, and they have not recurred in successive crops.

Typhoid fever can be excluded by means of the diazo and Widal tests, and it may be also excluded by the white blood count as, in uncomplicated cases of typhoid fever, the white count will be normal while in acute osteomyelitis the white count will be greatly increased, and it may reach twenty or thirty thousand; and if there is a disintegrating septic clot in one or more of the sinuses of the dura mater, the polynuclear leucocytes may be increased up to 95 per cent.

When an acute osteomyelitis enters the subacute stage and assumes the appearance of typhoid fever, the less hopeful is the prognosis.

Pain is a constant symptom and is manifested early; it is situated either at the point where the nutrient artery enters the bone, or at the site of the primary infection in the bone, which is usually the antrum in an acute osteomyelitis of the temporal bone that is consequent to a purulent otitis media.

In acute osteomyelitis of the temporal bone the infection is disseminated rapidly and we will have areas of apparently healthy bone situated between areas of bone that have undergone necrosis; on account of these widely distributed areas of necrosis there will be points of tenderness on pressure other than where the nutrient artery enters the bone and over the site of the antrum.

Septic phlebitis and thrombophlebitis of the mastoid veins are quickly developed in these cases and consequently points of tenderness on pressure will be found early where the mastoid emissaries and the veins that are tributary to the sinuses enter the bone.

The pain is described as being excruciating and of a deep boring character, and increases in severity until necrosis of the inner or outer table takes place and allows the pus to escape into the soft tissues that are in relation with the bone; when this occurs the pressure is released and the acute pain is abated.

If the outer table is thin or if it is of moderate thickness,

redness of the skin and swelling of the overlying soft structures will be an early symptom as the periosteum soon becomes involved; when the outer table is of unusual thickness or has become eburnated through a process of rarefying osteitis, these symptoms are not seen early, as they are not manifested until the periosteum has been invaded through a septic thrombophlebitis of the communicating vessels.

In the majority of these cases the inner end of the posterosuperior membranous canal wall will be found to be sagging and baggy; while this is the rule it is by no means a constant symptom, as the anatomical conditions that are productive of this symptom are not always present in a given case; when this symptom is present you will not fail to find pus when the case comes to operation.

If we consider the aural discharge that is present or the history of a discharge from the ear in the past, with the other symptoms that are manifested, we should not have much trouble in arriving at a correct diagnosis; but we all hear of cases dying every year in which the "running ear" was not thought of sufficient importance to merit consideration as a possible etiological factor in the fatal termination of the case.

The prognosis in an acute osteomyelitis of the temporal bone is very grave unless it is recognized early and prompt surgical measures adopted, as the patient may die within twenty-four to seventy-two hours from the onset of the symptoms, the system being overwhelmed by the rapidly generated toxins.

The treatment of these cases is essentially surgical, although the medical side of the case should not be lost sight of.

Case I.—Miss C., age twenty-four years. This case was referred to me by Dr. Harry Curtis, March 17th, 1900.

History. Heredity, negative. Personal: She had an attack of grippe about four weeks ago and during the latter part of the attack an acute otitis media developed in the right ear; the ear discharged only slightly and ceased to discharge several days ago. She had a severe chill at two o'clock this morning, the chill was followed by a rise in temperature and profuse perspiration.

Present condition: 12 a. m., March 17th, temperature 97 1/5° F., pulse 120, thready and intermittent; skin is sallow; abdomen is slightly distended, and the spleen is enlarged.

She locates the pain in the mastoid and pressure over the

antrum and tip as well as at the point where the emissary vein enters the bone, produces severe pain. There is swelling over the mastoid and upper third of the neck, and the skin is quite red.

The perforation in the drum had closed and the inner end of the postero-superior membranous canal wall was not sagging; the drum was only slightly congested and was not bulging.

An operation was proposed but this was rejected, the family stating that they would rather wait a day or two before having any "cutting" done.

March 18th, 10 a. m. The patient was very restless during the night and had a chill at 4 a. m. Temperature 105° F. Pulse 140, weak and intermittent. Respiration 36, and somewhat jerky in character. The pain had increased in severity and the mastoid and cervical edema was more pronounced.

Operation was again proposed and the consent of the family obtained.

The patient was taken to the hospital and chloroform administered at 3 p. m. When the periosteum was incised, quite an appreciable amount of bloody serum was set free. When the outer cortex was opened, pus and granulations were found scattered about the mastoid and the zygomatic cells. The inner table over the vertical portion of the sigmoid sinus was removed, as it was thought from the violent symptoms that were manifested that we had to deal with a septic thrombus in the sigmoid sinus. Such did not prove to be the case, but a small extradural abscess was discovered at this point.

The wound was irrigated with a 1 to 3000 solution of bichlorid of mercury and 75 per cent alcohol and packed with iodoform gauze strips.

This patient's temperature did not rise above 100° F. after the operation, and that was on the following day. When this rise in temperature was noted the wound was immediately dressed, after which the temperature became normal and remained so.

I wish to call your attention to the fact that this case manifested all of the cardinal symptoms that are laid down in the books as indicating a septic thrombosis of the large sinuses of the dura mater, yet when the patient came to an operation such was not found to be the case.

Was the small extradural abscess that was present in this

case responsible for the alarming symptoms that were manifested, or were they due to the rapid absorption that was taking place from the septic thrombi in the mastoid vessels? I am rather inclined to accept the latter view.

Cases of the character of the one just reported only show us that we cannot be too positive as to whether we have or have not to deal with a septic thrombosis of one or more of the dural sinuses until the skull is opened, and in not a few instances, until the sinus in question itself is laid open.

Case II.—White male, age twenty-two years. This patient was referred to me January 26, 1904, by Dr. A. Howard Smith, who stated that he had been treating the young man for several days for a streptococcic tonsillitis and that on the 24th inst. the patient began to complain of severe pain in the right ear; the drum ruptured the following day but the pain was alleviated only for several hours when it began to increase in severity and was referred to the mastoid region.

Patient had a severe chill several hours before I saw him and was sweating quite freely at the time of my visit.

Previous aural history is negative.

Present condition: Temperature 101° F. Pulse 120, irregular and easily compressed. Respiration 24.

The right tonsil was covered with a grayish-white exudate that could be easily detached and did not leave a denuded bleeding surface. A swab was taken from the throat and streptococci were found.

There was some swelling over the mastoid and the integument presented an intensely glazed appearance. A copious flow of sero-sanguinolent fluid was coming from the middle ear through a perforation in the inferior-posterior quadrant of the drum membrane and there was some sagging of the inner end of the posterior-superior membranous canal wall; a slight pulsation was imparted to the discharging fluid as it came through the perforation in the drum.

After cleansing the external auditory canal, a smear was taken from the discharge as it came through the perforation. This smear was handed to Dr. Smith for examination and he reported that streptococci were found.

A calomel purge was ordered to be followed by a bottle of Red Raven water, and an ice bag was applied to the mastoid. The nurse was ordered to irrigate the ear with a hot 1 to 5000 solution of bichlorid of mercury every two hours.

January 27th, 7 a. m.: Temperature 99° F. Pulse 100. The nurse stated that the patient had been very restless during the night and that he complained of a great deal of pain in the mastoid. The swelling of the tissues over the mastoid had increased and the post-auricular groove was obliterated. There was marked increase in the tenderness on pressure over the mastoid tip and antrum and the inner end of the posterior-superior membranous canal wall was sagging to a greater extent than it was the previous evening. Ophthalmoscopic examination was negative.

The patient was advised of the necessity of an early operation, his consent was obtained and he was sent to the hospital and prepared for an immediate operation.

The bone was exposed in the usual manner, and when the periosteum was incised a small amount of pus escaped. The outer table was opened with a gouge and mallet; the cortex was very thin in this individual and pus flowed out of the cells when the first chip of the bone was removed. There were numerous areas of carious bone, pus and granulations throughout the mastoid, extending into the middle root of the zygoma and into the cells of the occipital bone.

After thorough curettage the wound was packed with iodoform gauze strips and an outer dressing of plain gauze applied.

January 28th. Called at 8 a. m. and found that the patient had had a slight chill at 2 a. m. and that there had been a rather low but rapidly fluctuating temperature during the night.

Sinus thrombosis was suspected and the young man was taken to the operating room and chloroform administered. The sigmoid sinus was exposed in its vertical portion. On removal of the inner table a small quantity of pus escaped and it was seen that the sinus wall was beginning to ulcerate, but a palpable clot could not be detected.

While the sinus was being uncovered in the direction of the jugular bulb it ruptured at the lower margin of the ulcerated portion and there was a free flow of blood. Hemorrhage was controlled by packing iodoform gauze strips against the wall of the vessel.

January 31st. Temperature 99° F. Pulse 84. The dressing was taken down and the wound was in a healthy condition.

February 8th. Patient's condition had been all that could be desired until today, when he began to complain of pain and tenderness along the lower third of the sterno-cleido-mastoid muscle; there was a slight amount of edema in this region. There was a gradual increase in the pain, tenderness and edema in this region until the morning of February 15th when distinct fluctuation was elicited in Zang's space.

During this time the temperature was not above 99° F., nor the pulse above 85.

Under chloroform anesthesia an incision was made into the space between the sternal and clavicular attachments of the sterno-mastoid muscle and an ounce of pus was set free. This pus was found to contain streptococci. The mastoid wound was inspected and a small area of carious bone removed.

From this date the patient made an uninterrupted recovery and was discharged as cured at the end of nine weeks from the date of the primary operation.

In this case I wish to call your attention to the rapidity with which the mastoid was invaded following so closely as it did upon the initial infection of the middle ear, and to the great destruction of tissue that had taken place in so short a time, as only three days had elapsed since his ear began troubling him.

I also wish to call your attention to the low temperature during the night following the primary mastoid operation, and yet we had a serious intracranial complication to deal with.

I think that the chill and temperature variations during the night succeeding the primary operation were due in part to a dislodging of the septic plugs that were in the mouths of the vessels in the mastoid that are tributary to the sigmoid sinus. These septic plugs may have been set free by the manipulations that were essential to the operation on the mastoid.

Here is a case where it would not only have been the height of folly, but would have meant the loss of valuable time and the life of the patient might have been compromised, if the abortive plan of treatment had been prolonged.

Case III.—Male; German-American. Age 51 years.

I saw this case in consultation with Dr. R. W. Athey on the morning of January 31, 1904.

History. About six weeks ago the patient had an attack of la grippe which was complicated by a purulent otitis media in

the left ear, and the ear had been discharging profusely during this time.

For the past three days he has had considerable pain in the mastoid accompanied by more or less supraorbital pain. He had a severe chill the day before he came under my observation. On the third day before I was called into consultation Dr. Athey noticed that the mastoid region was becoming edematous.

Present condition: Temperature 101 3/5° F. Respiration 28. Pulse 126. The face has an anxious, drawn expression and the skin and conjunctivae are of the color of saffron; the tongue is heavily coated and the breath is foul. The abdomen is distended; the spleen is enlarged and the bowels have been constipated for the past ten days.

There was marked edema over the mastoid; this edema extended upward to the vertex, backward to the occiput, forward over the temporal fossa and articulation of the superior maxilla and downward on to the neck. He complains of pain over the entire left side of his head and says that the pain is noticed most at night. The integument of the edematous region has a red glazed appearance not unlike an erysipelatous blush.

The slightest pressure applied over the site of the antrum produced exquisite pain; the mastoid tip as well as the points where the blood vessels enter the bone were very tender to pressure. Percussion on this side of the head increased the general head pain. There was a free discharge of thick yellow pus from the middle ear. The external auditory canal was thoroughly cleansed and a large perforation was seen in the lower anterior quadrant of the drum membrane. A smear was taken from the pus as it came through the perforation in the drum and was found to contain staphylococci. The inner end of the postero-superior membranous canal was not sagging much, there being only a slight interruption of the angle between the drum and the membranous canal. He complained of a dull aching pain in both eyes and they were sensitive to light. Pupils were moderately dilated and they were sluggish to light and accommodation. Ophthalmoscopic examination was negative. There was slight horizontal nystagmus as well as vertical subjective vertigo.

The patient's consent was obtained and he was sent to the hospital to be prepared for operation the following morning.

February 1st. The anesthetic was started at 9 a. m. and

the patient did not take it kindly as he had been quite a liberal user of alcoholic beverages.

An incision was made down to the bone and quite a large serous subperiosteal effusion was found. The bone was opened with gouge and mallet but pus was not encountered until we had almost reached the antrum, as the cortex in this individual was very dense and thick.

When the antrum was opened about four drams of thick, creamy pus was set free; this pus contained staphylococci. The inner table overlying the vertical portion of the sigmoid sinus and the superior and posterior walls of the antrum were completely eroded. The outer wall of the sinus and the exposed dura of the middle fossa were covered with a thick mass of granulations; as these granulations did not appear to be healthy they were trimmed off with small curved scissors.

As this was a diploetic mastoid a large number of small disseminated abscesses were found in the subcortical cells of the tip, the cells above the external meatus, the middle root of the zygoma, and in the cells in front of the glenoid fossa.

The wound was irrigated and dressed in the usual way.

There was a slight rise of temperature following the operation but this immediately declined after the wound was dressed.

This patient made an uninterrupted recovery and was discharged six weeks from the date of the operation free from nystagmus and vertigo.

I think that this case is a typical one of acute osteomyelitis of the temporal bone due to a staphylococcus infection.

The destruction was rather slow but it was very extensive.

The patient had only one severe chill but there were a number of slight rigors, and these taken in connection with the rapid and feeble pulse would have justified one in suspecting a sinus thrombosis, and I would probably have laid open the sinus and searched for a thrombus if the failing vitality of the patient had not precluded such a procedure.

These cases should be dressed often, for if they are allowed to go until the outer dressing is soiled they will reinfect themselves and symptoms of absorption will be manifested.

DISCUSSION.

Dr. Joseph C. Beck said that the recital of the two cases by Dr. Dabney did not convince him that he had true osteo-

myelitis to deal with. From the author's description, he took them to be ordinary cases of mastoid abscess following a suppurative process in the middle ear, and involvement of the sinuses. These cases interested him particularly because he had had recently a similar case. It was a case which involved the region of the emissary vein, and in which locality there was necrosis. A fistula led from the beginning or termination of the emissary vein to the inner wall of the middle ear, that is, at the posterior inferior portion of the middle ear. In the operation he followed the fistulous tract, and necessarily had to go through the facial nerve. When Dr. Dabney spoke to him of his cases, he thought this case might have been one of osteomyelitis in this region, with fistulous formation towards the middle ear or an absolute perforation in that region. He had never come across a case of this kind in his experience before, and said that if osteomyelitis did take place there we had an interesting pathologic condition to consider.

Dr. R. B. Canfield said that recently he had been following a couple of intracranial cases that were troubling him somewhat. After reading of osteomyelitis of the temporal bone, one was apt to consider as osteomyelitis cases of septicemia, the pathologic changes of which in the temporal bone were exactly similar to those which took place in mastoiditis. In fact, they were just exactly the same, but the patients had a pyemic temperature, and associated with that infection of the general system, without infection of the blood sinuses of the dura. This was not uncommon, and a pyemia associated with mastoiditis should not be considered as osteomyelitis simply because there was no thrombosis of the dural sinuses.

He mentioned a case he had under observation at present, because it showed how possible it was for a very grave intracranial condition to be present without the exhibition of symptoms. The patient was a man, over sixty years of age, a physician, who had been quite a musician, and who was quite certain that he had perfect hearing in both ears always. Without the exhibition of any previous symptoms, he found himself one day in his yard compelled to walk around to the left; there was some impairment of vision; he did this three or four times before he became unconscious. The next thing he remembered was that he was taken to an operating table and operated on by Dr. Charles Mayo without an anesthetic. Dr. Mayo thought he had sarcoma of the cerebellum, so he did

nothing to the cerebellum. Later, after the second incision had healed, a discharge occurred from the right ear characteristic of cholesteatoma. At present the patient had a cholesteatomatous discharge from the right ear, and the speaker was able to pass with ease, and without any resistance, a probe directly inward through the anterior part of the mastoid and backward to a distance of three inches from the inner surface of the tragus. From this cavity the tentorium was felt above the probe. He had not as yet had a chance to take an X-ray.

Dr. John J. Kyle said he was somewhat interested in acute osteomyelitis. According to Warren and other pathologists, we could have an acute or chronic osteomyelitis of the flat cells of the long bones; but an acute osteomyelitis of the temporal bone would probably be a primary infection rather than one secondary to an inflammation or suppuration in the middle ear. It would be difficult if we had a suppuration of the middle ear, to differentiate an acute osteomyelitis from an acute mastoiditis, as we understand the disease to be. Symptoms of acute osteomyelitis were much more severe than those of an ordinary acute mastoiditis, because in a child with acute osteomyelitis there was a high temperature. There was rapid destruction of the fat tissues of the body; there was rapid destruction of the red corpuscles; there was rapid emaciation, diarrhea, collapse, and not infrequently death. Thus the disease sometimes went on and became chronic and we had necrotic bone which either sloughed away or was removed. He accentuated the point of slumbering mastoiditis, which he said had not been mentioned in the discussion.

Dr. Dabney, in closing the discussion, said with regard to the remarks made by Drs. Beck and Canfield, he was not convinced that his cases were not instances of osteomyelitis, as they represented the same symptoms as acute osteomyelitis of the long bones. He intended to establish the differential diagnosis between acute osteomyelitis and septic thrombosis of the sinuses before operation, but he had not been able to do so in any of these cases until he got into them.

PAPER:

REPORT OF A CASE OF ABSCESS OF THE TEMPORO-SPHENOIDAL LOBE OF AN OTITIC ORIGIN.

JOHN J. KYLE, M. D.

The history of abscess of the brain from chronic middle ear suppuration is quite frequent, and according to Gowers, in 173 cases, 102 were of otitic origin. The percentage of cases of brain abscess, following years after all observable suppuration of the ear has passed away, from a condition of slumbering mastoiditis, would be of particular interest.

The report of the following case is important because it accentuates the necessity for a careful consideration of the history of middle ear disease and its approximate valuation in the diagnosis of acute or chronic brain disease.

Mrs. Mc——, age 36, was brought to St. Vincent's Hospital November 11, 1905, by Dr. Williford of Washington, Indiana and the following history was given by the husband and Dr. Williford:

No luetic history; married eleven years; no severe sickness during that time; has three children living, all strong and healthy; two children dead, one died of meningitis and the other of uremic poisoning; suffered from an acute inflammation of the right ear nine years ago, followed by a discharge from the ear, which continued for six weeks; no history of any subsequent discharge; recurrent attacks of earache during the winter months; during last three years, each subsequent attack was a little more severe; previous to the last six months, the pain was always in the ear, but since that time the pain has been just above the ear; the pain was constant, at times being a dull ache and at others a severe boring pain.

In April last, the patient suddenly fell with loss of consciousness, followed by a loss of control of the hand and leg of the right side; complete loss of sensation in arm and leg.

This continued for about two weeks, when the patient was able to be about with the assistance of a crutch. The numbness in the arm and leg continued for about two months. For a longer period than a year, the patient has complained of a severe dizziness, with a tendency to fall to the affected side. At times the patient suffered from nausea and vomiting. Following the discharge from the ear, an eczema manifested itself along the right tibia. Upon examination, we found a long scar and two or three hard nodular masses, as though there might have been periostitis at some time. The ulceration on the tibia continued for at least one year. About twelve days before her entrance to St. Vincent's Hospital she became delirious, especially after sleeping. This would continue for quite a while after awakening. Sleep and relief from pain was only secured by the use of large doses of morphin.

When brought to the hospital she was delirious and unable to walk. When I saw the patient she was in great agony, moaning and tossing about the bed. Her speech was incoordinate and unintelligent. Temperature was 99.4. There was no tenderness or swelling discernible over the mastoid; tympanic membrane clear and glistening; light spot normal. The upper lid of the right eye drooped somewhat, with dilation of the pupil and slight convergence. Babinsky's sign was absent; no anesthesia of arms or extremities; optic fundus normal in both eyes.

With the foregoing subjective signs to guide us, the mastoid process was opened. The cortical substance was hard and sclerosed. No discharge was found on opening into the antrum. On exploring the roof of the antrum, the middle cranial fossa was opened without perforating the meninges. The mastoid process was now obliterated as nearly as possible. The whole process was entirely sclerosed with the exception of two small superficial cells the size of a wheat grain. The roof of the antrum and temporal bone in proximity were now removed with a rongeur forceps. A semilunar shaped portion of the temporal bone one-half inch wide, extending forward for one inch, was removed, exposing entirely the meninges. They were found to be of a grayish-blue color, fibrous and tough. The membranes were opened with a pair of scissors. At the site of the opening a pocket was found about the size of an ordinary hen's egg, partially filled with dark blood, pus and broken

down brain tissue, indicative of subacute abscess. The broken down substance was partially curetted away. There was no distinct outline to the abscess. The middle ear and aditus ad antrum were hard and smooth, and in consequence the middle ear was not disturbed. Following the curettment of the broken down brain tissue, the wound was irrigated with a normal salt solution and packed with a strip of iodoform gauze. A profuse discharge of bloody pus followed the removal of the gauze on the following day. Microscopic findings from the abscess, when first opened, showed a pure staphylococcus pyogenes aureus infection.

The discharge which now followed each dressing for five weeks was pure pus, varying from a tablespoonful to a slight tinting of the gauze at the end of the fourth week. At the end of the fifth week the wound in the meninges was allowed to close. The closure of the post-auricular wound was uneventful. The patient was discharged from the hospital at the end of the eighth week. The patient was quite irrational for two weeks after the operation. She complained of severe pain in the temporal region, which necessitated the hypodermic use of codein for two weeks, especially at night. After this the pain gradually subsided and all opiates were dispensed with. On account of the old tibial scar, iodo-neucloid in thirty-grain doses was given from the beginning, with instructions to continue the treatment for an indefinite period. The eye symptoms partially disappeared after seven weeks, when, with the aid of glasses, the patient was able to read satisfactorily. The patient was perfectly rational and in apparently good health at the time of leaving the hospital. In walking, the patient showed a slight incoordination, with an inclination to move to the right side. The husband now reports the wife to be free from any brain irritation and in better physical and mental condition than for a year.

By way of explanation of the paresis, we may say, if there is a crossing of the motor fibres, then from this lesion it would be impossible for the lesion in the right temporo-sphenoidal lobe, or right half of the cerebellum, to produce paralysis, partial or complete, in the right arm or right leg alone, as the motor fibers, when they cross, do so in the lower portion of the medulla. While the motor fibers do so cross in the vast majority of cases established, about 95 per cent of all human

beings, from a lesion located as in this case, we would, in consequence, have motor paralysis in the left arm and left leg. This would be equally true if the abscess extended forward and inward sufficiently to affect the right peduncle. In other words, if in this patient the usual decussation of the motor fibers occurred, the lesion found in the right temporo-sphenoidal lobe and cerebellum would not account for the symptoms present, and we would conclude that a second lesion occurred, presumably in the left internal capsule. This lesion might have been embolic, thrombotic or hemorrhagic, and might well have been only temporary in its effect. Let us attempt for the moment, however, to associate the clinical symptoms presented with the existence only of the lesion of the right side of the brain found at the time of the operation. We know from experience that a very respectable per cent of individuals have no decussation of the motor fibers, but that they take a course from the cerebral hemisphere to the extremities of the same side of the body, instead of crossing to the other side, and it is not beyond reasonable conjecture that in this patient this anatomic condition existed. If this were actually the case, it is not difficult to conceive that pressure from the abscess in the right temporo-sphenoidal and cerebellar region could be sufficient to produce symptoms from the right peduncle and upper pontine regions, causing motor paralysis upon the same side of the body, by reason of the fact that the usual motor decussation was absent. When we consider that the sensory and motor symptoms of right arm and right leg were of a comparatively transient nature, and had practically passed away upon our first examination of the patient, it is more reasonable to assume that the paralytic symptoms were not due to the abscess in the right sphenoidal region, but to an acute hemorrhagic embolic process in the left internal capsule. In other words, we had at one time two lesions, primarily the abscess in the temporo-sphenoidal lobe, and a transient secondary extravasation in the left internal capsule.

PAPER:

THE TREATMENT OF PERFORATION OF THE NASAL SEPTUM.*

MAX GOLDSTEIN, M. D.

DISCUSSION.

Dr. Edwin Pynchon complimented Dr. Goldstein on the technic of his procedure, saying he could readily see the utility of it, and personally he thanked him for presenting this method of treatment.

With reference to crusting, he had found that in a comparatively plain septum up to the point of perforation, the perforation had been caused by picking the nose, and in such cases he discovered a thickened condition of the septum or a ridge back of the perforation, and by removing the enlargement which was on the septum back of the perforation, the perforation ceased to carry those incrustations which it previously did. In other words, it ceased to be an annoyance to the patient. A perforation in a septum that was practically plain on either side did not give incrustations; it did not cause annoyance, and the principal reason why these perforations were troublesome was on account of the constant picking of the nose, owing to the stoppage of the nose from the enlargement on the septum higher up.

Dr. Hanau W. Loeb pointed out the necessity of making a distinction between specific and non-specific perforations. The non-specific perforations were almost altogether anterior, in which the cartilaginous tissue was such that this method would be of considerable service. However, in all likelihood, after some years, the same condition might return. Of course, one could do what he had done in the first place. In the second place, for the specific perforations, where there was

*See page 81.

any dead bone it would have to be removed, but he fancied that in such cases, since the perforations were farther back, there would be difficulty in using this method, and then he could use a chisel or something of that nature and accomplish the same results. It seemed to the speaker that Dr. Goldstein had offered an important suggestion, and he hoped to learn that he had succeeded in working it out definitely.

Dr. Charles S. Means said he had had a number of cases recently of non-specific perforations following usually typhoid fever, where the nurse had picked the septum through, and patients presented themselves to him with crusts, and while he had seen the cartilage penetrated through, he had been able to heal the perforations, so that crusts did not form, by medicinal applications, as, for instance, by argyrol and keeping them clean and applying mercurial ointment, with adrenalin, or something of that kind. With these measures he had been able to stop the crusting. Probably if treatment was not instituted for a while, the crusts would return. He had hoped that the best method of closure of these perforations would be touched upon.

Dr. William L. Ballenger said he had heard of the treatment of the projecting ledge of cartilage being handled in the way Dr. Goldstein mentioned, within a week (he had forgotten who it was who spoke of it) the gentleman obtaining the same results as were secured by Dr. Goldstein. He saw here a new use for the swivel knife, but not the one the members were familiar with, but the one published by him—the swivel blade attached to a single, instead of a double prong. The single prong instrument could be introduced into the nostril and it would cut the anterior as well as posterior edge, indeed, all edges of the perforation.

He was interested in the flap operation for closing the septum, and said that at a recent clinic they considered the advisability of attempting to close the opening in a manner similar to that indicated by Dr. Goldstein. Several distinguished rhinologists were present, but a number of them decided that they had no confidence in the results. Dr. Ballenger thought that if they had heard what Dr. Goldstein had said, they might have taken a different view. In a case he had in mind, however, the perforation was large, and he thought it would have been difficult to perform this operation, and that it would be well to have done the submucous opera-

tion first, any way, as there was marked deviation posterior to the perforation. The suggestion of Dr. Goldstein he regarded as a valuable contribution to the surgery of the nose.

Dr. Goldstein, in closing the discussion, said he hesitated to present his suggestions for the correction of septal perforations, as he had been informed by a local colleague that something of the kind had been published. If this were true, however, he would be glad to know it.

MEETING OF THE SOUTHERN SECTION, NORFOLK, FEBRUARY 13, 1906.

PAPER:

PRIMARY MASTOIDITIS.

S. MacCuen Smith, M. D.

The question of primary mastoiditis, strictly speaking, has interested the profession for many years. Fulton, in 1887, in a paper entitled, "Acute Primary Inflammation of the Mastoid Cells," made the following observation: "This disease is so extremely rare, or so imperfectly understood, that only a few of the standard works on otology notice it as an individual disease, but speak of it as extending from the surrounding parts, as from the tympanic cavity, or the external auditory canal." He further adds: "It has always seemed to the author of this paper that acute primary inflammation of the muco-periosteal lining of the pneumatic spaces of the mastoid process is sufficiently common to merit a much more careful study and better classification, than it has yet received. Several cases of this disease have come under my observation within the last few years, in which, had the true nature of their maladies been diagnosed, the patients would have been relieved of pain and agony which extended over weeks and months." In the discussion which followed the completion of his paper, Bishop of Chicago stated that: "Professor Fulton treats not only of primary inflammation of the mastoid antrum proper, but of the mastoid cells, which constitutes the whole interior structure of the mastoid process. Had he maintained that the mastoid antrum proper is the seat of a primary circumscribed inflammation, limited to that part only, my experience could not have corroborated his assertion, for I do not remember to have met with a case in which such a diagnosis would have been warranted. Indeed, I cannot think that primary inflammation of the mastoid cells is frequent, except

as the result of traumatic injury. I have witnessed the occurrence of the latter, but am not satisfied that it occurs independently of traumatism, or middle-ear disease."

St. John Roosa reported a case in 1876, of which he said: "There was redness, swelling and tenderness over the mastoid process. An incision was made and a considerable quantity of pus evacuated. This was followed by recovery. No caries was detected. There was not the slightest evidence of any congestion or inflammation of the external auditory canal or middle ear."

Continuing all the way from that time till now, but especially during the past twelve years, we find an occasional case reported which seems to strengthen the belief, if it can even now be considered a belief, that infection of the mastoid process, involving antrum or cells, or both, may occur independently of any middle ear infection.

And the object of this paper is not to attempt to prove that such is true, but merely to add what seems to the author further testimony in favor of the affirmation, that in the final weighing of evidence for and against, we, as seekers after truth, may be better able to arrive at a conclusion, and hence be better prepared to give our patients the benefit of disciplined judgment.

The following case, reported by David Webster in 1879, is of interest: "March 17th, 1875.—Mrs. S., aet. 70, sent for Dr. W. Cheatham, then House Surgeon of the Manhattan Eye and Ear Hospital, now of Louisville, Ky., who noted the following history: 'Five weeks ago, while sneezing, she "felt" a crackling noise in her right ear. It sounded as if something had burst in the ear. She has suffered intense pain in and behind the ear ever since, and has, in consequence, usually passed sleepless nights. There had been no discharge from the ear at any time. No physician has been consulted. She tried once to relieve the pain by dropping camphorated oil into the ear, but this made the ear worse. She has dropped laudanum into the ear three or four times a day for three weeks, and this has given her some relief.

" 'She is now suffering very much from pain over the whole of the right side of the head, and extending down her back and neck. There is a great swelling, tenderness on pressure, and redness over the mastoid. The swelling of the walls of the external auditory canal prevents examination of the mem-

brana tympana. There is facial paralysis of the right side. The patient experiences some difficulty in swallowing, but this, she says, existed before the ear disease.

"'She states that her sight has failed rapidly during the last three weeks, and that she sees all distant objects double. She is subject to asthma, but has not suffered from it since the commencement of the ear affection. Hearing was reduced to ability to hear the watch when pressed against the auricle.

"I saw the patient on the evening of the same day, with Dr. Cheatham, and made an incision down to the mastoid, about one inch in length, half an inch behind and parallel to the attachment of the auricle. So great was the swelling that the scalpel penetrated to a depth of three-quarters of an inch by measurement. No pus escaped, but there was free bleeding. No examination for diseased bone was made on account of the severe pain caused by the incision, the operation being done without any anesthetic. The wound was well stuffed with lint and hot poultices applied, to be exchanged every three hours. An opiate was given to relieve the pain. 18th.—The pain continued up to six o'clock this morning, when it abated, and at eight o'clock she was found sleeping. There is slight discharge from the external auditory canal—the first that has been seen. There is less tenderness over the mastoid. She is now able to lie on her right side, which she has not done for the last three weeks on account of the increase of pain so produced. P. M.—Visited the patient with Dr. Roosa. She says she feels like a new person. She has slept most of the day without an opiate. The discharge from the auditory canal is much more abundant, and the tenderness over the mastoid is less. Dr. Roosa advised a continuance of the warm poultices. 19th.—The patient rested well without an anodyne. Pulse 82; temperature 96.5°F.; appetite and vision improved. Removed tent and inserted a clean one. Poultices to be continued and the ear to be syringed several times a day with warm water. 20th.—Tenderness and swelling over mastoid diminishing; pulse 82; temperature 98.5°F. While exploring the wound with a probe a sinus was found large enough to admit a No. 1 Bowman's probe, a quarter of an inch in length and extending forwards, upwards and inwards from a point nearly opposite the upper portion of the attachment of the auricle. Changed the tent and ordered the poultices to be continued. Ordered fifteen drops of tincture ferri chlorid

three times a day. 23rd.—Only slight tenderness over mastoid. Found the tent removed and the incision healing. 24th.—Found the patient cheerful and much improved. All tenderness gone. To leave off poultices, and dress the healing cut with a greased rag. 26th.—The patient says that her appetite is excellent. The double vision has disappeared, and she declares that she sees as well as ever. There is still paralysis of the 7th nerve and a slight discharge from the ear. There has never been any discharge from the wound, which is now rapidly healing. The swelling of the walls of the canal is almost gone. 31st.—The facial paralysis is much better; she swallows with less difficulty; the incision is nearly healed; there is still slight discharge from the ear. She declares that she feels better than before for six months. April 12th.—The patient came to the Manhattan Eye and Ear Hospital. There is still slight discharge, but the membrana tympani is intact. The posterior wall of the external auditory canal is swollen, and near the junction of the cartilaginous with the membranous portions a teat-like process is seen. This teat-like process is a small mass of granulation tissue surrounding an opening through which the bent end of a probe can be easily passed. It seems most probable that this opening is the source of the discharge. The facial paralysis has almost entirely disappeared, and the patient now hears the watch on contact. 21st.—A slight discharge still continues. The teat-like process remains unchanged, and pus can be seen oozing from it. Dr. Agnew, who saw the patient at this visit, advised an incision through the granular mass on the posterior wall of the canal, but the patient objected to it, as she "felt perfectly well."

In concluding, Webster states: "Cases II, III and IV are remarkable as having been cases of primary inflammation of the mastoid cells. All the text-books on the ear treat mastoid cell inflammation as secondary to, or a complication of, inflammation of the middle ear, and I think that it is nowhere stated that the disease sometimes occurs independently of the latter. In cases III and IV the membrana tympani was found intact, and there was no evidence that it had ever been perforated; but there may have been a secondary inflammation of the middle ear in both cases, not sufficiently severe to produce ulceration of the drum-head, while the primary inflammation of the mastoid cells was such that in both cases caries of the bone was produced, resulting in a persistent fistulous

opening into the external auditory canal. In case II it will be remarked that the mastoid inflammation existed for some time before there was any discharge from the ear, and the latter, indeed, did not make its appearance until the former had subsided.

"Although in the majority of cases there is no doubt that the inflammation extends from the posterior nares, along the Eustachian tube, through the middle ear, into the mastoid cells, yet there is no good reason for believing that the inflammation cannot, in the nature of things, originate in the mastoid cells themselves, and travel, perhaps, in the opposite direction."

Among those who in more recent years have written on the subject and reported cases, which more or less confirm the affirmative side, are Hasbrouck, in 1891; Rickets, 1892; McBride, 1894; Roy, 1896; Sheppard, 1897; Dench, Gradle, Dunn and Snydacker, 1902; Barck and Knapp, 1903; Donnellan, 1904, and Politzer, 1905.

Hasbrouck states: "Authorities agree in placing it among the rare forms of ear disease. In fact, a good many have the feeling that some form of middle ear disease must have been the starting point, and on general principles I have felt very much that way myself, as up to this time I have always been able to trace a close connection between the two in mastoid troubles. At present I feel quite sure that it is possible for an inflammatory action to start primarily in the mastoid region."

McBride, in his book on Diseases of the Throat, Nose and Ear, page 550, says: "Primary inflammation of the mastoid cells has also been observed, leading subsequently to inflammation of the middle ear and perforation of the drum membrane."

Dench, in his book on Diseases of the Ear, page 449, says: "Primary mastoiditis, although uncommon, is occasionally seen, and may follow an exposure to cold or a traumatism, or may be a manifestation of a tuberculous or specific diathesis. This last condition is probably the most common cause of a primary mastoid inflammation, a gummatous deposit occurring and subsequently breaking down in the characteristic manner."

Gradle (Diseases of the Nose, Pharynx and Ear, 1902, page

476) says: "Primary mastoiditis is very rare, and is probably an osteomyelitis of the mastoid bone."

In the paper of Dunbar Roy, in which he covers a considerable part of the literature on the subject, as well as reports a case, the following conclusions are drawn: "(1) Primary abscess of the mastoid is more common than a periostitis. (2) That this pathologic condition is more frequent in children than in adults. (3) The most common causes are syphilis and tuberculosis, and the latter is much more frequent than the text-books would lead us to believe. (4) That the prognosis is nearly always favorable, and a full restoration of the parts is the usual result."

Knapp, after reporting a case, observes that "Cases like this, where the membrana tympani shows no, or only trifling, inflammation and where all the symptoms point to the mastoid, have been described as primary mastoiditis, but such cases are the rarer, the more accurately we examine, and it is now generally believed that they begin in the usual way, but the infection travels through the tympanic cavity with no perceptible symptoms, whereas its action manifests itself conspicuously in the mastoid."

Politzer speaks of primary inflammation of the mastoid as among the rarest affections in aural disease. He divides the inflammation in this region as being limited to either the periosteum or to the pneumatic cells of the mastoid bone proper. He says: "The inflammation, which occurs after catching cold, but usually without any traceable cause, affects either a limited part of the periosteum, or spreads over the mastoid region even to the temples. It is characterized by the formation of a hard, usually red swelling on the mastoid process, which becomes ill-defined toward its margins and is painful on pressure. Sometimes, though not constantly, the superior portion of the sterno-cleido-mastoid muscle is, as Knapp first observed, involved in the inflammatory process. With the exception of a slight reddening on the posterior wall of the auditory meatus, no inflammatory symptoms are to be found on the membrana tympani or in the meatus. The function of hearing is normal, rarely weakened by old standing adhesive processes in the middle ear or by accumulations of serous fluid. The most important subjective symptoms are violent spontaneous pains in the inflamed area, which radiate in various directions over the head. The accompanying

pyrexia is usually moderate, but may reach a high degree if abscesses form. The diagnosis depends on the objective changes of the mastoid process, taken together with the absence of inflammatory phenomena in the other portions of the temporal bone. In long continuance of the infiltration and pain, the possibility of a secondary affection from inflammation of the external periosteum extending to the interior of the mastoid process, cannot be excluded. It is possible by a superficial examination to confound this with those painful swellings on the mastoid process which sometimes exist in cases of deep-seated furuncles on the posterior wall of the auditory meatus or in primary inflammation of the lymphatic gland lying on the mastoid process, where it cannot be easily moved."

Politzer further says: "The prognosis of primary periostitis mastoidea is favorable."

And Barck, in a synopsis of one hundred cases of mastoid operation, reports two as primary.

Thus, notwithstanding the apparently large amount of evidence given, it seems that we are all inclined to a doubting state of mind, till cases come under our own observation. The writer confesses that he had always believed the cases of so-called primary mastoiditis to be in fact either coexistent with, or secondary to, some inflammatory process in the nasopharynx or tympanic cavity, though these conditions may have escaped the attention of both patient and physician.

It is conceivable, even reasonable, to assume that some infectious agent of the nasopharynx could migrate through the Eustachian tube into the tympanic cavity, thence to the mastoid antrum and cells without involving the parts through which it passes in even an appreciable inflammatory process. Granting the above hypothesis to be correct, we have a rational explanation of the etiology of primary mastoiditis, if, indeed, we are justified in giving this affection the distinction of a separate disease. When the micro-organisms, notably those of influenza, pneumonia and tuberculosis, become lodged and confined within the mastoid cells, not having ready means of escape, they are at once in possession of inviting soil for rapid propagation and consequent destruction peculiar to their kind. The rapidity with which the subsequent involvement proceeds depends largely upon the fact as to whether the cells were formerly subject to some inflammatory process,

however slight, and regardless of the length of time that may have elapsed between the former and present attack.

In later years it is not uncommon to find the mastoid involved, by continuity, either of the empyema type, or in an osteitis with softening and destruction of the cells, without the tympanic cavity being implicated in more than a slight seromucous discharge, which made its appearance minus the acute symptoms incident to such a condition. Then, again, mastoiditis not infrequently occurs, by continuity, in which the membrana tympani is only slightly inflamed, but presenting no additional changes from the normal. Neither of these varieties of mastoiditis can be classed as primary, notwithstanding the very mild nature of the tympanic disease, and the entire absence of discharge and other symptoms peculiar to acute middle ear disease.

In passing it may be of interest to state that the writer has seen many of the primarily mild, and apparently inoffensive cases, develop into the most virulent and destructive processes involving the mastoid bone.

The term primary, therefore, when used to designate affections of the mastoid process, can be applied to, or accepted as, a distinct ailment in only those cases in which there is an entire absence, primarily at least, of either Eustachian or tympanic disease. If, then, we accept the actual existence of primary mastoiditis we are prepared to grant that the tympanic cavity may secondarily become involved by continuity, with the same assurance that mastoid disease is usually secondary to a similar process in the tympanum. It is with a case of this character that I invite your attention for a few minutes.

Case I.—H. B., female, aged 2 years, 5 months. Family history negative. The child has never had any of the acute exanthemata, but at the age of twenty months was operated upon for tuberculous glands of the neck, from which she seemed to make a good recovery. The swelling on the neck had been noticeable for three months prior to the operation, and one month before operation she developed jaundice, which lasted till after the operation. The only point of interest between this and the time she was brought to the Jefferson Hospital was a fall which occurred about three weeks before the mastoid trouble developed, though it appears to have had no connection with the mastoid swelling; the mother merely

remembers that the child fell, striking the back of her head on the floor, not hurting her enough to cause her to cry.

Two weeks after this, while combing the child's head, the mother noticed that the head seemed tender on the left side. This tenderness became more marked during the following days, but it was not until the morning of the day that the child was brought to the hospital that the swelling was noticed back of the ear. On examination at the hospital dispensary by my chief of clinic, the only symptoms found were the marked swelling and redness over the mastoid process, with rather marked pain on pressure. The drum membrane was quite normal in appearance, without the slightest redness or drooping of the superior posterior wall of the canal.

She was at once admitted to the ward, with directions that an ice bag be applied for six hours and at the same time calomel in divided doses was begun, followed by magnesia a few hours later. Temperature on admission was 100½°, and during the next six days ranged between 101° and 97°, till the operation was performed. All symptoms disappeared after ice for a time. At the end of six days the characteristic drooping of the posterior and superior canal became very marked.

Case II.—This case is of interest chiefly on account of the extensive necrosis which involved the entire process, together with a carious opening through the cortex, and an absolute absence of all symptoms, occurring in an unusually healthy child of thirteen months of age.

C. H. W., aged thirteen months, the son of a physician, had been an exceptionally healthy child during its brief period of life. Six months prior to the appearance of the ear disease, the patient suffered from a slight "cold," possibly a mild bronchitis, from which it made a good recovery. On the morning of May 5, 1905, the nurse, while giving the child its usual bath, noticed a swelling back of the right ear, to which she directed the father's attenion, he in turn notifying the writer, who saw the patient at noon, advised an immediate operation, which was performed at the Germantown Hospital three hours later.

An examination revealed a moderate fluctuating swelling over the mastoid process, which was not painful on pressure. The external auditory canal, membrana tympani and tympanic cavity were absolutely free from all signs of inflammatory or

other pathologic changes. Not in any respect had the child given evidence of ill health; it slept well, digested its food perfectly, as its splendid health indicated.

On making the incision through the soft parts, we evacuated a quantity of pus and found a carious opening through the cortex about the size of a pea. On enlarging the spontaneous opening we found the entire cavity involved in the necrotic process, all of which was removed, the child making a quick and perfect recovery. At no time during the course of the case was there any evidence of middle ear infection.

Case III.—The family history of this patient was likewise negative, and her personal history contained nothing of interest regarding the condition reported. At the age of fourteen, she was struck on the left side of the head, just over the mastoid process, with a snowball, from which, however, she suffered no pain further than slight soreness for a few days. Three months later, however, she noticed slight impairment of hearing on that side, which was of short duration, this being followed by the development of pain, for which, in compliance with the directions of her physician, she used various local applications and internal remedies without any perceptible effect. Four years ago, which was four years after the original traumatism, she was sent to the Jefferson Hospital Dispensary by her physician, who three days before had made an incision just through the skin over the mastoid.

In the hospital the simple mastoid operation was done, a large quantity of pus and necrotic tissue being found in the antrum and cells. No evidence of middle ear or external auditory canal disease.

DISCUSSION.

Dr. C. W. Richardson: The paper has certainly brought out some very excellent points, especially as to the primary mastoid inflammation.

I remember the first case of this character I saw. It was an insane patient, and I for a long time doubted the possibility of the occurrence of primary mastoiditis. This man was at the St. Elizabeth, the United States government hospital for the insane, and he was sent to me from that institution. He had all the classical symptoms. The membrane was apparently perfectly normal. There was not the slightest discoloration; there were no indications of catarrhal affection. The

attending physician at the institution assured me that the man had never had a suppurating ear, and the attendant who had charge of the man also assured me that this was the case. The mastoid cells were completely destroyed.

I saw another case with Dr. Dench, but it was not a characteristic primary mastoiditis. The child had acute inflammation of the middle ear, but not a suppurative inflammation The membrane was intact. In this case the infection in the ear had occurred previous to the apparent primary mastoid symptoms; we say that this must have been the case because the destruction was too great to have occurred from the recent inflammation of the middle ear, which we saw at the time. There was infection, and I found a large extradural abscess. In this case the child was about fifteen years of age. These cases may occur, but I think in most of them the inflammatory changes in the middle ear are so slight that they are hardly noticeable at the time, and the infective material passes up into the mastoid antrum, and that excites the mastoid changes, the changes in the middle ear being so slight as not to attract attention. It seems to me that the infection of the mastoid cells is impossible without this infection getting into the middle ear and out through the antrum. We do have cases of this character.

Dr. Woodward: I have always believed there was no such thing as primary mastoiditis, but every now and then we stumble on a case that shocks our previous ideas. Last summer a lady from the mountains of Virginia, stopping at Virginia Beach, had some ear pain and consulted me, and the only symptom she had was pain on moving the ear. She had absolutely no cold, and had had no previous cold; she had never had any ear trouble in her life, and she told me if there was anything foreign to her condition it was certainly trouble about the nose or ear. I found she was running a slight temperature; after four or five days under my observation there developed a decided swelling over the middle portion of the mastoid, and I decided to operate, because the temperature had reached about 100, and remained there. I found a little pocket of pus in the cells next to the antrum, but apparently no pus in antrum. Now, how pus got there I don't know. It was there, and I found it. Whether there is such a thing as primary mastoiditis or not I don't know, but this case looked like it.

Dr. W. S. Bryant: I have never seen a case that I thought was primary mastoiditis. The nearest was a colored woman that I operated on last summer, who had a chronic catarrhal otitis media in both ears. The patient showed no evidence of there having been an acute inflammation in the tympanum, nor was there any history of discharge or perforation of the membrana tympani. The history was that six weeks previous, the patient had had earache. The patient had been admitted to a general hospital on account of severe headaches. When I saw her she had marked tenderness behind the mastoid process and a slight rise of temperature. Operation showed an epidural abscess, and an apparently healthy mastoid antrum. Some of the mastoid cells behind the antrum lying anterior to the epidural abscess were filled with granulations. I considered the case one of secondary involvement of the mastoid cells following an acute otitis media, and not one of primary mastoiditis. If for any reason the history of the recent middle ear inflammation had been lost, it would surely have been taken for a case of primary mastoiditis. It is reasonable to imagine that in a hypothetical case, bacteria which had gained access to the tympanic cavity without causing any inflammation, might penetrate into the mastoid antrum or cells and then set up an inflammation. Cases of this kind must be extremely rare.

Dr. Jas. F. McKernon: It has been my opinion for several years that a primary mastoiditis did not occur unless from trauma. Several years ago I reported a case of what I believed to be a primary mastoid involvement in a child eight years old, but subsequently I learned that the child had had a discharge from the ear of the affected side several years previous. When the case was first seen there was no evidence from physical signs of any middle ear involvement, and I thought it was a distinct primary involvement of the mastoid, but as soon as the previous history of the case had been learned, I discarded the theory of primary involvement. I saw a case two months ago which is to be reported as primary mastoiditis, and which I am sure was not for this reason. The child was under one year of age, and when seen there was a subperiosteal swelling back of the ear, and the history was that some eight weeks before the child had had a slight cold, followed by a discharge from the ear. This discharge had lasted for three weeks, and then subsided rather suddenly.

The drum membrane had healed, and the little patient went on to apparent and complete recovery for five or six days. At the end of that time the baby began to run an irregular temperature, and was treated for broncho-pneumonia. The physician stated he could not attribute the temperature to any other condition than that of a slight cough which the baby had. Here we have a case treated for broncho-pneumonia, and afterward looked upon as a primary mastoiditis, which, I believed, without doubt was the result of the infection from the middle ear. After operation the child made an uneventful recovery.

Dr. J. A. White: It has been my experience that sometimes symptoms might present themselves that would give us a false impression of having a case of primary mastoiditis when it is due to something else. I have had two cases recently that are rather interesting because of the symptoms and the result. In one case the patient began to have very violent pain over the lower part of the mastoid running down to the neck, and followed by tenderness over the tip, and every symptom of Bezold's mastoiditis. Examination of the ear showed the drum head and hearing structures were perfectly normal, but in the posterior part of the external meatus it was reddened and tender to the touch from the drum membrane forward into the cartilaginous portion. I was so well satisfied I was dealing with a primary mastoiditis, as there was no previous history of trouble in the ear, that I suggested he let me make an exploratory opening in the mastoid. He refused, however, positively to have anything done, but, as he continued to suffer, eventually he consented to go upon the operating table, but asked me to avoid doing a mastoid operation if possible. When I put him on the table, I concluded I would simply try an incision running from the drum membrane forward in the external meatus through the periosteum and through the cartilage in the apparently inflamed region. I made this incision and let him alone. In a few days all the symptoms subsided, and he has had no trouble since. This case had accompanying symptoms that looked like mastoiditis, and all that was done was the incision into the external meatus, which gave relief. I had a similar case in a young lady, who had previously had a mastoid operation performed, at which time the diagnosis was primary mastoiditis and when the mastoid was opened all that was found was simple sclerosis. I found the same

condition of affairs as in the first case, and the same incision gave relief: an incision in the external meatus, through the periosteum to the bone and through the cartilage. Here also all the symptoms pointed to mastoiditis. In one case the pain was below the antrum and over the tip, and in the other case the antrum and the upper part of the mastoid. Neither case had any furunculous inflammation in the meatus, and, therefore, the condition must have been due to a periostitis or enchondritis which resulted in the fallacious mastoid symptoms.

Dr. E. B. Dench: I have recently seen a case which, had it not been followed throughout its entire course, might easily have been considered one of primary mastoiditis. The patient came to my clinic, complaining of pain in his ear. Examination revealed a little effusion in the tympanic cavity, but not sufficient to require evacuation by incision. The appearance was that of a subacute, catarrhal inflammation. I saw him a few days later, and, as the pain continued, and as there was some bulging of the drum membrane, the membrana tympani was incised. The ear did not discharge after the incision, and the incision closed in a few days. As he still complained of pain, I admitted him to the ward, and the drum membrane was incised a second time. There was a very scanty discharge after the incision, and a bacteriologic examination of the discharge showed a few staphylococci. The patient ran a little temperature for a few days, the temperature sometimes rising as high as 101½°, and then falling to normal. After the first few days the temperature remained practically normal. The incision in the drum membrane healed perfectly, and the drum membrane began to resume its normal appearance. The patient still complained of pain, and finally developed some tenderness over the mastoid tip. This tenderness increased slightly, and, after he had been in the hospital a week, there was some tumefaction over the tip of the mastoid. I operated upon him and found the tip cells filled with pus, the other cells and the antrum being free from pus. The pathologic process at the tip had extended so far as to expose the lateral sinus, so that at the time of operation the man was really suffering from an epidural abscess. Had the patient passed from observation after the incision in the drum membrane had healed, there would have been nothing in the appearance of the drum membrane to indicate involvement of the middle

ear, and the case might thus have easily been considered one of primary mastoiditis.

I am free to confess that the more cases of mastoiditis I see the more difficult I think it is to decide at exactly what time operation is imperative. In all of the cases of mastoiditis upon which I have operated, I have never, in a single instance, failed to find pus in the mastoid, and in most of my cases I have regretted that I did not operate a day or two earlier. In my experience I can only recall one case in which the mastoiditis was primary in character. In this instance, the drum membrane was absolutely normal, and there was no history of there having been any previous aural trouble.

PAPER:

RECURRENT MASTOIDITIS: ITS CAUSE AND PREVENTION.

JAMES F. MCKERNON, M. D.

By recurrent mastoiditis I mean the redevelopment of a necrotic area, or areas, throughout that portion of the mastoid bone that has been left subsequent to a previous operation, or operations, and not dependent upon tubercular or other diatheses.

While the number of cases of recurrent mastoiditis is by no means as large at the present time, as in years past, yet that cases do occur from time to time we must admit, and if occurring, there must be some specific cause, or causes, for their development. It is the hope of the writer, that by pointing out some of the etiological factors, and dwelling for a few moments upon them, fewer cases may occur in the future, and also to obtain a frank discussion upon this subject.

My remarks will be confined to those cases that have previously been operated upon, partially healed, and then have had the reparative process remain at a standstill as far as a final healing is concerned.

Causes.—The majority of causes can be classified under three heads. First, those in which an infection takes place from the mastoid area itself; second, from the middle ear cavity; and third, by an infection occurring from without during the primary healing of the wound.

The principal cause for an infection taking place from the mastoid area itself, is that during the first or subsequent operations, all of the diseased bone has not been removed, and this area at first is covered by granulations that look healthy. The wound apparently does well up to a certain point, then there appears a little more secretion than before, the granulations are softer, break down easily, and a depression is left in the wound surface, while on all sides of it the granulations are firm, grow up around it, and fill up all other portions of

the cavity except the depression referred to. This may go on indefinitely, every portion of the mastoid cavity healing, except one point, and this point continuing to discharge for weeks or months, or, as in some cases, finally becoming sealed over with a thin, cicatrical band, and remaining so for weeks, or even a few months, only to break down and discharge again if the patient contracts a cold, or becomes through any cause, markedly below par.

These areas in the mastoid bone that cause such tardy and prolonged healing, and break down the tissue from time to time, may occur in any part of the mastoid cavity, but their usual sites are, first, the anterior portion of the zygomatic root, which overhangs the entrance of the aditus into the middle ear. In a large number of adult cases, this portion of the zygoma is cellular, and the primary infection travels quite as readily in this substance as it does in the mastoid structure proper, and unless this infection be removed when the case is first operated upon, it is a prolific cause for a secondary infection, or recurrence, taking place.

At times the infection will become so deep-seated in this region that it is necessary to remove so much bone that an exposure of the dura, as well as the removal of the whole roof of the aditus, will be demanded before all of the infective material can be taken away. Indeed, in some of the cases, so well developed is the cellular structure in this region, and so thoroughly infected has it become, that all of the disease cannot be removed through the ordinary mastoid incision, and it becomes necessary to extend the original incision anteriorly in order that a large portion of the root may be exposed for removal. Even though a considerable area of the dura should be exposed in this region, in our efforts to eradicate the disease, it is much better and safer for our patient that we do this, than that an infected area be left to give him trouble later.

The second site, where a diseased area is usually left, is that portion of the zygomatic root, called for purposes of convenience, the posterior root. It is that portion lying above, and extending between the bend or knee, of the sigmoid groove below, and the roof of the mastoid cavity above, that forms the floor of the middle cerebral fossa. While in this region the cellular elements are by no means as well developed as in the anterior root, still in a number of cases, they are of suf-

ficient number and size to give subsequent trouble if they are not eradicated at the time of the primary operation, and in well developed adult skulls they extend backward beyond the line where the parietal bone dips downward and forward to form the suture with the mastoid bone.

A third site for an infection to be left during a primary operation, is that portion of the bone lying over, and behind the sigmoid groove, covering what may conveniently be termed the posterior medullary spaces. These spaces, in some skulls are very large, and frequently filled with pus, and were our work confined to the mastoid cavity proper of a few years ago, would never be discovered at the time of the first operation. These spaces extend from behind the sigmoid groove as high up as the knee, downward toward the bulb, following the natural curve of the groove, and at times extend as far posteriorly as the occipital bone. In certain other cases there is no apparent communication between them and the mastoid cavity proper, and they are only discovered by here and there a softened area of bone lying in front or above them, and when this softened area is followed up, a communication is demonstrated between the two points. Another sign of infection in these spaces is that the external cortex covering them is at times much darker than the surrounding bone, and when this physical sign is present, there is almost certain to be a pus accumulation beneath.

A fourth site for an infection to be left in the mastoid process is in the tip, but this does not occur with the frequency that it did in former years, owing to the fact that particular stress has been laid upon the point, that in all operations in this region, the tip be removed in its entirety, or down to a level with the inner table. In former years many a recurrent mastoiditis took place because at the time of the first operation, the tip was left untouched, when in reality it contained as much, if not more, pus than any other portion of the mastoid.

Another cause from which a secondary infection, or recurrence, takes place, is the mastoid involvement occurring as the result of an exacerbation of a chronic purulent middle ear lesion. Take for instance, a chronic purulent discharge occurring from the middle ear, from time to time, covering a period of several years, at times quiescent, or even entirely absent, and making its appearance again after a cold has been con-

tracted. During one of these exacerbations, the mastoid becomes involved, and a simple Schwartze operation is done, with the result that healing is only partial. The wound breaks down again and again, because it has become infected from the middle ear, where necrotic bone has existed for a long time. In attempting to remedy this condition, the mastoid area may be operated upon time and again, without success, and why? Because the dead bone in the tympanic cavity has never been removed, and is constantly discharging pus back through the aditus into the mastoid area that has been operated upon. The successful treatment of such a pathologic condition is obvious. At the time of the primary involvement of the mastoid, a complete Schwartze-Stacke operation is demanded for a permanent cure. Recurrence from this source can be avoided if a careful physical examination of the middle ear be made at the time the mastoid becomes involved, and if evidence of necrosis be found, the radical operation on the tympanic structures is demanded, as well as that upon the mastoid bone.

A third cause of recurrence, and one which occurs not infrequently in clinical hospital practice, is that the wound during the healing process becomes infected, either through lack of proper asepis, or through the carelessness of the patient in not having the dressings done at proper intervals, thus allowing an absorption of the secretions. Again, the dressings may become displaced, and the wound area left exposed for a period of time sufficient to enable infection to take place, or the patients may themselves cause an infection with their own hands, in attempting to replace them.

A point we are prone to overlook in the convalescence of these cases, is that many of them need tonic and supporting treatment at this time, in order that the wound may heal rapidly, thus shortening the convalescent stage. For a large number of these cases are markedly below par at the time of operation, and it is the belief of the writer that healing would materially be hastened, if some little attention were devoted to the building up process, instead of placing too heavy a burden upon nature, without giving her the assistance she needs.

DISCUSSION.

Dr. J. F. McCaw: I would like to add the weight of my experience to what Dr. McKernon has said. It seems to me

we cover the subject of the cause of recurrent mastoiditis quite thoroughly when we say, that in the large majority of cases it is due to the incompleteness of the primary operation. Recurrence is not likely to take place if all cellular structure of the mastoid is thoroughly removed at the first operation. Chief in importance I believe to be the zygomatic and tip cells. An illustrative case I had about a year ago in a child eight years of age. I did, as I thought at the time, a thorough operation; the wound healed kindly and uneventfully. With the first head cold afterwards there developed a recurrent mastoiditis. At the second operation I found that some of the zygomatic cells had been overlooked at the primary operation and were the seat of infection in the recurrence. After a thorough removal of these the case made an uneventful recovery. In another case, which was seen in consultation by a prominent member of this society, but operated upon by a general surgeon, the tip was left. I saw this case later with a recurrent mastoiditis. A secondary operation was done with removal of the tip and some of the most posterior cells which was followed by an uneventful recovery. It is my belief, based on personal experience, that the more thorough we are at our primary operation the less likely are we to get the recurrences.

Dr. E. B. Dench: Dr. McKernon mentions the dark color of the bone as indicative of the fact that there is disease beneath. I think that quite as important a sign, is the fact that the bone bleeds easily. I always make it a rule to remove all bone which bleeds easily, and never to consider my operation finished until firm, dry, nonbleeding bone is reached. This matter was exemplified in a case upon which I operated a short time ago. The only sign of disease in the bone was the fact that the osseous tissue was very vascular. On continuing the use of the curette, I exposed a number of cells in the posterior part of the mastoid, which were filled with pus. These would have been entirely overlooked had I not followed the rule of continuing the removal of all vascular bone.

The next point is the exposure of the dura in the primary or second operation. I don't think it makes much difference if you do expose the dura. The cavity fills up very quickly, and I have yet to see that the exposure of the dura during the operation does the least damage, provided proper asepsis is observed. Another point I did not notice that he mentioned was caries of the incus. I think the incus is most frequently in-

volved, and I also think it is quite a common cause of recurrent mastoiditis, especially in children.

Dr. MacCuen Smith: There are two points I would like to refer to which have been mentioned. The most important one, I think, is in the bleeding bone. I simply want to say if one will follow up the bleeding bone where we have mastoidal involvement it is unhealthy bone, and I believe if you allow a bleeding bone to remain behind, you allow a necrotic bone; and the second point I wish to mention is the importance of the exposure of the dura. Personally I have yet failed to see bad results come from the exposure of the dura with proper use of antiseptics.

Dr. Kennon: I think Dr. McKernon's ideas about the recurrence of mastoiditis are very good. We are all so afraid to expose the dura that we will leave some dead bone at the root of the zygoma untouched, and in a majority of cases you find out afterwards that the trouble is at that point. I think we always have evidence, such as bleeding or discolored bone, to follow up the posterior cells. Another source of reinfection is from the middle ear when the discharge from that cavity does not stop promptly even though there be no caries in the middle ear.

Dr. MacCuen Smith: I would like to ask Dr. McKernon what he considers the danger of having Bell's paralysis follow the operation on the middle ear in removing the necrotic bone.

Dr. McKernon: I do not know whether the doctor means in doing a secondary operation on the mastoid, or in doing a Stacke operation.

Dr. MacCuen Smith: Yes, a Stacke operation, commonly known as the radical operation.

Dr. McKernon: I think the danger very little where you have a complete and thorough exposure of the middle ear cavity in your field of vision, and can ascertain before you use the cutting instruments, the course of your facial canal. If this be done, I think the danger of facial paralysis is reduced to a minimum.

Dr. MacCuen Smith: Suppose you have caries?

Dr. McKernon: I reported a case in which the roof of the facial canal was removed, and the nerve exposed, and you could pass a probe down and touch the nerve. In this case there was no paralysis following. I have had, as I believe we all have, cases where the necrosis is situated around the facial

canal, and in removing the diseased tissue I have gotten a temporary facial disturbance, and I think it is impossible where the necrosis extends over and around and beneath the facial canal in many cases not to get paralysis, and certainly where the bone is necrosed and the nerve exposed at the time of operation, it is almost impossible for one to do a thorough operation and not get a certain amount of facial disturbance, but in the other case where you simply do a radical operation for recurrent mastoiditis, and where the caries does not extend through and into the facial canal, it is very slight. The only point I have to add, in closing the discussion on my own paper, is the one that Dr. Dench spoke of, about the continued bleeding, which I omitted to mention. The point I wished to bring to our minds is that we should go deep enough and do a thorough and complete operation at the first sitting so as to prevent these recurrences from taking place. I do not wish to be misunderstood regarding the exposure of the dura. I say so now, and I said so in the paper, that its exposure usually caused no unpleasant symptoms, provided the wound was left clean.

PAPER:

OPERATIVE TECHNIC AND AFTER-TREATMENT FOR MASTOIDITIS WITH EPIDURAL COMPLICATIONS.*

W. Sohier Bryant, M. D.

The following cases contrasted, illustrate three interesting and important points:

First, the use of the front-bent gouge in preference to a mallet-driven instrument;

Second, the use of the modified blood clot in aural surgery;

Third, the question of packing the mastoid wound after exposure of the dura mater.

Case I.—This case was demonstrated at the annual meeting of the American Otological Society in 1904. Three months before the operation, the patient suffered from grippe followed by earache. A month later, headache began. At this time, there was a sero-purulent, non-fetid discharge from one ear and very little tenderness behind the ear. There was no edema. On the day previous to the operation, the tympanum was filled with inflamed tissues which had been partially removed on several occasions. Pressure showed marked tenderness of the mastoid process, this tenderness being more intense posteriorly. The patient suffered from continuous severe headache. The temperature was 100° F. by mouth; pulse 88; respiration 20.

Operation.—I commenced the usual mastoid operation under ether anesthesia. An incision convex backward about 2 cm, behind the posterior edge of the meatus was made down to the periosteum, extending from the tip of the mastoid process to the level of the upper attachment of the pinna. With a sharp Bacon's periosteum elevator (Fig. 2) the periosteum was divided in the line of the incision and pushed forward and backward, great care being taken not to lacerate it.

When the bone was well exposed, I applied my front-bent

*For figures see pp. 340, 341 and 344.

gouge (Fig. 1) at the point of election, 2 mm. below and 6 mm. behind the spine of the meatus, and drilled a hole 3 mm. deep in the bottom of which some cells were opened. (My gouge makes the blows of a mallet unnecessary and it uncovers the sinus without danger of injury.) I then used my gouge to make a trough 8 mm. long through the outer table of the bone, parallel to the anterior border of the mastoid process. Next, with a rongeur, I enlarged the opening in all directions until it was about 15 mm. long and 10 mm. broad. With a curette, I then broke down the cells lying within the mastoid process, working chiefly in the direction of the antrum, that is, inward and slightly forward from the point of election and parallel to the posterior wall of the meatus. To make sure no foci of infection remained, I removed all the cells. The antrum contained a few drops of pus and some granulations.

The cells about the antrum were filled with granulations which bled readily, particularly in the upper, inner, and back part of the bone cavity. Following this lead, I uncovered a large area of bare dura, the size of a silver dollar. Both the inner and outer tables had been completely eroded and were absent. This exposed dura was covered with granulation tissue. In order to get free access to this area, the skin wound was enlarged backward by a horizontal incision extending for 2.5 cm. from the centre of the first incision. I then removed the whole mastoid process with the rongeur and broke down all the remaining cells with the curette. To make sure that no infected bone could remain, I removed, with the rongeur, all the bone surrounding the bare dura, until a border of normal white dura 4 mm. wide extended on all sides.

The lateral sinus appeared traversing the denuded dura and I removed with the rongeur the outer third of the posterior wall of the meatus to allow the pinna to sink inward to obviate any possible deformity or pitting behind the auricle. I washed the whole wound carefully with normal salt solution to refresh the injured tissue and to clean off the loose, infected material and dust which might be in the wound. I inserted a rolled-up strip of ½ inch gauze for a drain which extended from the bare dura to the center of the skin incision. To promote union, I then put the periosteal and skin flaps in apposition. No

sutures appeared to be necessary to hold them there. I packed the meatus with plain gauze to promote drainage and to prevent the collapse of the canal. To encourage the flow of serum from the wound on account of its antiseptic value, I applied a gauze dressing moistened with normal salt solution.

Convalescence.—On the two days following the operation the patient was troubled with a stiff neck, but had no pain. The outside dressings were renewed twice because they were soaked. On the first day, the temperature was 100°, the highest point reached during the convalescence. I removed the gauze strip from the wound, and the packing from the canal. The wound was dusted with boric acid and the packing replaced in the canal. On the eighth day, the patient's temperature was 98°, pulse 84, and respiration 20. On the fifteenth day, the external auditory canal was dry and in good condition and the drum membrane healed. The posterior external wound was completely healed except a very small sinus at the center of the incision which led into the antrum and discharged a little turbid non-fetid fluid. On the 19th day, the acoumeter was heard 16 inches. On the 21st day, the post-aural wound was dry, healed and epidermatized. A small epidermatized pit was all that was left of the small sinus at the center of the incision. On the 23d day the hearing was good. The wound remained healed and solid, and the patient had gone back to laborious work. No pain, tinnitus, nor vertigo occurred after the operation. The resulting scar was very small and the outer surface of the scalp showed a very slight unevenness.

Case II.—The second patient was a heavy man, 36 years of age. Four months previous to the operation he had an attack of the grippe, followed in four days by great pain and swelling of the face and region of the ears, with discharge. When seen two days before the operation, a pure culture of streptococci was made from the discharge. There was no external appearance of inflammation, and the tenderness over the mastoid was not marked. The headaches were severe.

Operation.—I commenced a mastoid operation on the right ear under chloroform anesthesia and made a skin and periosteal flap like the one in the previous case. The mastoid cortex appeared normal and was rather thin. I perforated it by the

same method as in Case I. The process was large and cellular. The cells were small and filled with pus and granulations. The trabeculae were friable and were easily removed with a curette. I uncovered a perforation opening into the digastric fossa, but little or no pus had escaped. The inner table of the bone covering the knee and the descending part of the sigmoid sinus was crumbling. I easily removed it with a curette. The area of osteomyelitis extended downward, backward, and inward along the occipital bone nearly to the foramen magnum and the bulb of the jugular. The surface of the dura beneath this softened area was covered with granulations. As in Case I, I enlarged the skin incision backward and removed the surrounding bone with a rongeur in order to expose a healthy border of dura mater.

When I accidentally detached the emissary vein from the sinus there was free bleeding. I readily stopped it with a wad of iodoform gauze. With the curette, I removed the whole mastoid process which was exceedingly soft, and extended the osseous cavity upward through harder bone which contained granulations in numerous small cells. I separated the periosteum from the upper wall of the canal and the other half of the posterior wall with a special periosteal elevator devised for the purpose with a small, straight blade (Fig. 5). I used a narrow strip of flexible copper sheet to protect this periosteal epithelium from injury during the removal of these osseous walls and the cleaning of the tympanum because of the value of this epithelium in the final process of epidermatization. I removed the hanging wall of the meatus, thus opening the attic by the removal of its external wall and extended the cavity to include some zygomatic cells which were also filled with granulations. I did all this bone work with the chisel and mallet. I removed the drum membrane, major ossicles and as much mucous membrane as possible without injuring the facial nerve or stapes, using for this purpose a small ring curette. I then washed thoroughly the whole wound and ear with salt solution and slit the membranous meatus posteriorly along its inner third and packed it with iodoform gauze to separate its cut edges to assist in the epidermatization of the tympanic cavity. I packed the wound lightly with iodoform gauze because there was a question as to whether all

the infected tissue had been sufficiently removed and finally applied a wet dressing covered with rubber tissue.

Convalescence.—Three days after the operation when the dressing was changed it was very adherent in the wound and caused considerable oozing on its removal. There was no sign of infection. The gauze at the emissary vein was loosened and bleeding followed. On the 4th day, the meatus was dry. All the dressing on the posterior wound was stained and the gauze in the wound was adherent. The plug in the emissary was removed with little bleeding. Gentle packing with iodoform gauze was applied in the wound, and plain gauze in the meatus.

On the 9th day the gauze in the wound was moist and not adherent. There was no sign of infection. The wound was closing well from below and granulating evenly. Boric acid and a very little gauze were put in. On the 10th day the wound was moist and was filling up well. It was dressed with boric acid. No packing was used except in the meatus. On the 19th day the granulations were shrinking and the wound filling up. Boric acid was used in the meatus and the posterior wound and a strip of very narrow gauze placed in the post-aural opening. No gauze was put in the meatus. The bandage was adjusted to support the ear which had a tendency to droop. On the 20th day boric acid was applied. No packing was put in the wound. On the 21st day the wound was all cicatrized except an area the size of the end of a lead pencil. On the 22nd day the middle ear was entirely epidermatized and dry. On the 32nd day the meatus was opening well and the posterior wound wholly cicatrized. A slight deformity is noticeable owing to the pit at the centre of the incision. The patient complained of headache for the first three days after the operation besides appearing a little dull.

RECAPITULATION.

My front-bent gouge was very useful in perforating the mastoid cortex after which the rongeur and the curette did all the bone work, except in Case II. where the chisel and the mallet were used for the epitympanic work. The first steps of the operations were the same as in uncomplicated cases of mastoiditis. As the work proceeded the wounds were enlarged

sufficiently to uncover all the affected dura and bone was removed until healthy dura surrounding the diseased area was exposed.

After all the inflamed dura mater had been uncovered and all the affected bone had been removed, the wound in Case I. was closed without sutures, and the wound in Case II. was packed and left open. The unpacked wound collapsed and partially filled with a blood clot, and thus reduced the size of the cavity which had to granulate up finally and cicatrize.

In neither case were there any complications in the convalescence due to the exposure of a large area of dura mater. In Case I. the convalescence was very short and the deformity reduced to a nearly imperceptible scar and a scarcely perceptible pitting. In Case II., although the wound was not infected, the convalescence was much more prolonged, and the scar larger and the pitting deeper.

Conclusion I. The best results are obtained

First, By the use of the front-bent gouge instead of chisels or other gouges requiring the mallet, because it allows the convalescence to begin more quickly.

Second, By closing the mastoid wound and allowing it to collapse and partially fill with a blood clot to promote union by first intention, thus shortening the convalescence.

Third, By allowing the anterior flap of the wound holding the pinna to fall inward and backward and lie on the posterior and inner wall of the wound because this improves the post-aural cosmetic effect.

Fourth, By avoidance of packing which causes the formation of a large cavity requiring a long time to granulate up.

Conclusion II. The exposure of the dura mater is a complication of no special importance.

DISCUSSION.

Dr. E. B. Dench: I was very much interested in Dr. Bryant's remarks about the removal of the posterior wall of the external auditory meatus. Although other operators may have done this I have never heard it spoken of, nor have I seen it mentioned in print until I, myself, advocated the pro-

cedure at the last meeting of the American Otological Society. By removing the posterior wall of the external auditory meatus, the anterior flap falls backward into the wound, and healing takes place much more rapidly than where the posterior wall is left at its original height.

I cannot agree with Dr. Bryant as to the efficiency of his bent gouge, except in his own hands. It seems that the efficiency of any instrument depends largely upon one's familiarity with it. Personally I do not believe that the shock to the patient, attendant upon the impact of the mallet upon the chisel does any damage except in a few cases of brain abscess, where the impact may cause a rupture of the abscess into the ventricles. If the gouge is not held perpendicular to the surface to be cut, but at an angle, there can be very little shock from the impact of the mallet.

Dr. Berens: Did I understand Dr. Dench to say the removing of the anterior wall of the mastoid bone wound was adopted first a year ago? That has been rather a common practice with us in the Manhattan Hospital for some six or seven years to remove this posterior wall of the canal and we have found that by so doing we have shortened our convalescence and lessened deformity. I do not think it new.

Dr. J. F. McKernon: I do not know that I have seen it mentioned in the text-books or in the literature of discussions, but it is a part of the technic I have been following for several years. I am quite sure that it has been done for at least seven or eight years.

PAPER:

THE BLOOD-CLOT DRESSING IN MASTOIDECTOMY, CONSIDERED PHYSIOLOGICALLY.

H. O. Reik, M. D.

That the special surgeon can profit largely by keeping in close touch with general surgery is generally admitted, but that all surgeons would gain immeasurably from as intimate an alliance with physiology as they have established with anatomy and pathology is a fact, perhaps, not so well recognized. Commenting upon this matter, in his last review of surgery, in the December number of *Progressive Medicine*, Dr. Bloodgood alludes to the fact that the physiologist, not specially interested in practical surgical questions and not brought into contact with the daily vital problems confronting the operating surgeon, during his scientific investigations, learns many physiologic facts which would be of great value to the surgeon, yet, with the rarest exceptions, this valuable information is lost so far as the practical surgeon is concerned. An occasional collection and fitting together of bits of knowledge gained in the course of many physiologic investigations, studies made perhaps without a thought of their bearing upon surgery, might enable us to elucidate some of the important problems with which the surgeon has to deal The possibilities of such a plan occurred to me some months ago while listening to a discussion on the treatment of mastoiditis, and being deeply interested in the blood-clot dressing of the mastoid wound, I determined then to consider from the physiologist's point of view the advisability of employing that method.

It is only a few years since aural surgeons were discussing with great animation the proper method of procedure for the opening of the mastoid process when diseased. Today we do not debate over the propriety of a simple incision in the overlying soft tissues, a small perforation in the outer cortical layer of the bone or the more extensive invasion of the mastoidal cellular structure; unanimity of opinion has been reached upon that point. The history of the development of

the operation of mastoidectomy has been furnished us in a most interesting and entertaining way by Dr. Whiting and we will certainly all agree with him without cavil, however we may differ in the details of performing the operation, in the dictum that the operation of the present period has for its prime object the complete and immediate eradication of all the diseased tissue. In other words, in every operation for mastoiditis the surgeon now endeavors to remove every particle of pus, detritus and necrotic or carious bone, even though he be compelled to obliterate the cellular structure of the tip, the zygomatic process and the occipital region, or to invade the cranial cavity itself. Assuming that all this has been accomplished, however, does it constitute a complete operation?

I think we may accept as applicable to mastoid surgery a statement made by J. Collins Warren, with reference to osteomyelitis (in his Surgical Pathology), that "Modern surgery demands a complete operation; that is, one which insures rapid and permanent healing of the wound." Permanent healing of the wound will usually follow such an operation as is referred to above, but rapid healing is not so commonly assured. The ideal operation might be described as one which gives the greatest promise of a cure in the shortest possible time and at the least expense of comfort to the patient. If a mastoid wound be dressed with sterile or antiseptic packing at the time of operation the period of healing will vary from three to several months; very rarely will complete closure occur in less than this time, and I have frequently seen cases that required dressing over a period of six months. It can not be denied either that these dressings are often distressingly painful to the patient, and always time-consuming and more or less annoying for the surgeon. If a method of dressing the wound can be devised which will promote rapidity of healing without additional risk to the welfare of the patient, it will certainly add very materially to the comfort and happiness of both patient and operator. Such a method, I believe, has been provided for us in the blood-clot dressing, first recommended for use in the mastoid operation by Dr. Clarence J. Blake, of Boston, whose papers upon the subject you are doubtless all familiar with.

The primary object of this dressing is to obtain healing of the wound by first intention, but, when this occurs, other advantages accrue; for instance, the normal contour of the

mastoid process is restored, the resulting scar is a mere line, which is entirely hidden from view by the auricle, and the period of healing is reduced to five or seven days, with practically no after-treatment. No deformity, almost no scar, and primary union constitute, on the whole, a stake worth playing for. On the other hand, in cases where the blood clot fails to organize, there is no additional risk to the patient; should the wound not have been as clean as was supposed, or should the clot become infected in any one of various possible ways, it simply breaks down and the wound has to be opened, cleansed and packed in the usual way, the patient then being in practically the same position he would have occupied had the open method been employed primarily.

With the modern teachings of surgery constantly before us, that all pus cavities should be treated as open wounds and compelled to fill up by granulation from the bottom, it is not surprising that this suggestion of Dr. Blake's should have been received with skepticism. As I have talked with my confreres or listened to the discussion of the subject in otologic congresses, it has seemed to me that men hesitated to employ the method, first, because of a fear of the possible consequences of enclosing in the wound some microscopic particles of infective material, and, secondly, because they considered the normal blood clot to be a favorable medium for the growth of bacteria. So far the answer to these expressed or implied criticisms has been solely in the nature of relating clinical experiences. A certain percentage of excellent results have been shown by those who have used the blood-clot dressing, and, as yet, no one has related any unpleasant experience.

It is my purpose to take up these objections from another point of view, namely, to consider what happens when a clean cavity in bone tissue is filled with healthy blood clot, what power such a clot may have to overcome infective material that may have been inadvertently left in the wound, and whether general surgeons have any analogous experiences with other portions of the bony framework, to assist us in drawing conclusions regarding the mastoid portion of the temporal bone.

Experimental and clinical studies have shown that if any clean wound be filled with the patient's own blood, and safeguarded from later infection, the blood clot tends to organize

and new tissue, similar to that enclosing the clot, soon forms to replace the latter. The blood flowing into the wound cavity rapidly clots and the fibrinous framework of this clot constitutes a scaffolding upon which the new tissue is built. Fresh granulations spring from the walls of the cavity and grow out into the clot, forming a new fibrous connective tissue, the nature of which is further altered to accord with the character of the surrounding cavity walls; that is, if the wound be made in bone, osteoblasts are sent out from the bony walls or from the periosteum to convert the fibrous substance into osseous tissue. The migratory power of these osteoblasts is limited, and they travel only a short way from their starting point, so that in the case of a large cavity in bone the newly-formed bone does not extend far from the cavity wall and the center of the new-formed tissue remains fibrous in character. It seems quite probable, however, that in a small cavity, such as we ordinarily make in the mastoid process, the osteoblasts, reaching out from all directions, may extend a sufficient distance to meet in the center and thus complete the construction of a new bony process. Just how early this osteoblastic activity commences is not known, but such cells have been observed to form within forty-eight hours after the operation, and it is certain that granulation tissue grows more rapidly into a healthy blood clot than into space. It is plain, then, that nature may be greatly aided in the reconstruction of destroyed tissue by providing an excellent framework upon which to build and leaving her only the task of furnishing vascularity and new tissue cells.

But suppose the wound cavity to be treated is not absolutely clean, that some invisible particle of septic material is present when the blood is introduced, has the blood any bactericidal or antitoxic powers? A long series of observations by the most careful investigators has clearly proven that the normal human blood does possess such properties. Metschnikoff, Nuttall, Fodor, Lubarsch, Vaughan and Novy and a host of others have published most interesting work upon this subject. From their several experiences we may safely draw the following conclusions: that the normal human blood possesses bactericidal power, varying in degree in its antagonism to different micro-organisms; that this property of the blood is greater after it is drawn from the vessels than while circulating intravascularly; that the microbe destroying substance

is found in the serum, but is produced by the leucocytes; that certain chemical changes in the blood may be induced to either increase or diminish its bactericidal power; and that this property of the blood naturally diminishes after the clot is forty-eight hours old.

Nuttall[1], following a suggestion of Metschnikoff's, was probably the first to demonstrate the bactericidal power of normal blood serum. Working under the direction of Flugge, in 1888, he used defibrinated blood taken from various species of animals, and found that this blood destroyed the bacillus anthracis, baccillus subtilis and staphylococcus pyogenes aureus when brought into contact with them. He also confirmed the finding of Fodor, that after a while the blood loses its germicidal properties and becomes a suitable culture medium in which germs grow abundantly.

The fact having thus been determined that the blood serum removed from the body acts far more rapidly and energetically upon microbes than the plasma and lymph within the body, the disparity of action was further shown by Lubarsch[2], who attempted to ascertain the exact power of the blood of some animal over a given germ; using the bacillus of anthrax and experimenting upon rabbits he injected known quantities into the circulating blood, and found that this animal was quite able to take care of a dose of less than 16,000 germs, but if a larger were injected, fatal infection resulted. If he drew a small quantity of blood from an animal of the same class and size into a test tube and inoculated that with the same microorganism, many times that number of germs were destroyed; that is, one cubic centimeter only of the rabbit's blood serum would destroy more than 16,000 of these germs when inoculated into the clot outside the body, and he could not, after a few minutes, reproduce them by culture from the clot.

Then a most interesting series of investigations followed to determine what element of the blood possessed this bactericidal quality and how it acted. Vaughan and McClintock have presented the most conclusive report upon these points, and they hold that the leucocytes secrete some substance which is poured into the serum, that this substance is a proteid, and

1. Experimente über die bacterienfeindlichen Einflusse des thierischen Körpers. Zts. f. Hyg., Leipzig, 1888, 353.

2. Albutts' System of Medicine, Vol. 1, p. 89.

that the only proteid likely to be present in blood serum to which such properties could be attributed is nuclein.

The clotted blood possesses greater power than the circulating blood probably because in the formation of the clot the leucocytes break down and discharge their entire complement of this nuclein. Other workers have demonstrated the transient duration of this power in the blood clot, a power which seems to diminish rapidly after forty-eight hours, and the fact that certain chemical changes in the clot may cause a variation of its power. The bactericidal power seems to be present in freshly-drawn blood only when it is alkaline in reaction. If its alkalinity be raised above normal the bactericidal power will be somewhat enhanced, but if the blood be below normal alkalinity, or if it be rendered acid in reaction, such power is diminished or actually destroyed. The nuclein acts only in an alkaline serum. Again, if alcohol be added to the blood the bactericidal property is destroyed through the precipitation of the albuminoid constitutent. Bichlorid of mercury, likewise, has a deleterious influence upon the bactericidal property of blood serum.

These chemical experiments have an important bearing upon the use of blood clot as a surgical dressing.

The use of carbolic acid and alcohol for the cleansing of the wound, as an extra precaution of cleanliness, prior to the introduction of the blood, has been recommended by some surgeons, but it seems not unreasonable to venture the suggestion that some of the failures with the blood-clot dressing may have been due to excessive zeal in the use of carbolic acid and alcohol for antiseptic purposes. If exact neutralization were possible and the wound left in a neutral state no harm could result from the employment of these substances, but if there be left any measurable quantity of either it militates against success. Upon theoretical grounds it would appear more rational to rely upon dry cleansing of the wound with instruments and sterile sponges, or to wash the cavity with sterile salt solution, which, if it produces any effect upon the coming clot, renders it more alkaline, and increases its power to control septic material.

Leaving the realm of experimental medicine and turning to practical surgery, we find again the strongest possible endorsement for the employment of healthy blood clot in the healing of wounds. Some of you are possibly familiar with the epoch-

making report of Schede, Ueber die Heilung von Wunden unter dem feuchten Blutscharf, or know of the most excellent results obtained by Halsted and his associates in the treatment of osteomyelitis by this method. The whole subject was most excellently presented by Prof. Halsted several years ago, and, as there is no higher authority, I could do no better than quote from this paper.[3]

After reviewing the objections to leaving blood in wounds and the bearing of Lister's work upon the subject, he says:

"Although perfectly familiar with the organization of the blood clot, it has, apparently, never occurred to Lister to make a systematic effort to utilize the blood clot and to imitate nature's method of disposing of the dead spaces in wounds.

"He has taught us what can be done under the cover of antiseptics. One may maltreat the tissues to any extent, mutilate the wound during the operation in every possible way, cut off by ligatures the circulation in large masses of tissue, produce extensive areas of superficial necrosis by irrigation with antiseptic solutions, stuff the wound with gauze and drainage tubes, tear out the stuffing and with it the granulations which have grown into it, re-stuff, etc., and still the wound may heal without suppuration, without septic inflammation, and in a way which is, perhaps, altogether satisfactory to the surgeon.

"But now that wound infection is for many surgeons almost a thing of the past, we may ask ourselves if, after all, our wounds are ideal wounds. One naturally hesitates to attempt to give one's notion of an ideal wound. His ideal wound of to-day may not be his ideal wound of next year, or even of to-morrow. I conceive an ideal wound to be one which immediately after the operation is reduced to the condition of a non-penetrating subcutaneous wound, and which is as free as this is from the dangers of infection.

"Impressed by the work of Küster, Neuber and others, and entertaining with them the same fears of blood in wounds, it was my practice for several years to attempt with the utmost care to obliterate the dead spaces in wounds. The results were gratifying, but the technic was often very tedious. For example, after an amputation of the thigh it would not infrequently take an hour to obliterate all the dead space. The mechanical problems were sometimes quite difficult, and one

3. Johns Hopkins Hosp. Reports, Vol. II., pp. 255-261.

was perpetually annoyed by the fear that he might strangulate the tissues included in the sutures. After a time I became convinced that it was impossible to obliterate thoroughly all the dead spaces in some wounds, and I observed that wounds in which the dead spaces were not obliterated healed throughout by first intention just as regularly as did the other wounds. I was, therefore, quite prepared to welcome Schede's article on the healing of wounds under the moist blood scab. This contribution of Schede's[4] I believe to be the greatest which has been made to the technic of surgery since the introduction of antiseptic methods by Lister."

The immortal John Hunter was many years in advance of his time when he expressed himself on scabbing and the organization of the blood clot as follows: "In many deep-seated wounds, where all the parts have remained in contact, those underneath will unite much better if the surface be allowed to scab. Some compound fractures (more especially where the external wound is very small) should be allowed to heal in the same way, for by permitting the blood to scab upon the wound, either by itself or when soaked in lint, the parts underneath will unite, the blood under the scab will become vascular, and the union will be complete even when the parts are not in contact. Many wounds ought to be allowed to scab in which this process is now prevented, and this arises, I believe, from the conceit of surgeons who think themselves possessed of powers superior to nature, and therefore have introduced the practice of making sores of all wounds."

From these and similar experiments, I think we are fully justified in using the blood-clot dressing to complete the operation of mastoidectomy, and I only wish to add a few words regarding the technic of its employment. You will infer from what I have said that very little can be done to assist the blood clot in its possible conflict with overlooked septic material, but a good service can be rendered by avoiding some things that would tend to hinder the blood in its beneficient work.

In the first place, the nearest possible approach to absolute surgical cleanliness must obtain throughout the operation. This applies not only to the operator and his assistants, to the

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2. M. Schede. Ueber die Heilung von Wunden unter dem feuchten Blutscharf. Verhandlungen der deutschen Gesellschafft für Chirurgie, 1886.

sterilization of all instruments and the protection of the operation field by proper sterile sheets or towels, but to the perfect removal, so far as can be determined, of every particle of infective material and of diseased tissue.

Next, it is exceedingly important that the wound be closed in such a way as to prevent the introduction of new infection and to promote primary union. It is my personal opinion that a good many failures with the blood-clot dressing have been the result of faulty closure of the soft parts. Shreds of tissue that may be infected or that would prevent neat apposition of the margins, should be cut off. Chemical sterilization of the wound should not be attempted. If irrigation is considered necessary, employ sterile normal salt solution. Finally, for the closing of the wound use the subcutaneous silver wire suture recommended by Halstead.

You are all familiar with the experimental work performed some years ago by Prof. Welch on the sterilization of the skin. Making use of the most approved methods of cleansing the skin's surface, he could still secure a bacterial growth from the deeper layers of the corium and he determined that this region was the natural habitat of the staphylococcus epidermidis albus, which germ was the active factor in the production of the common stitch abscess. If you carry your sutures through the skin from side to side of the wound, you not only make the opportunity for a stitch abscess, but open up a new avenue for infection of the clot. In many instances this will not be sufficient to cause a breaking down of the clot, but if that blood is having a battle with septic particles within the cavity this may be the last straw needed to cause a break down.

Furthermore, in the subcutaneous method of suturing wounds, silver wire is the best material to use because it possesses antiseptic properties of its own. Some years ago Bolton, working in Kelly's laboratory, undertook to ascertain the relative value of suture materials, and he found that the best of all was copper wire and next to this came silver; inasmuch as the latter is, for commercial reasons, most available and the antiseptic properties but slightly different, he recommended the general use of silver. It can be easily and surely sterilized by boiling, while cat-gut is, under the best of circumstances, unreliable and silk is only less so. With a subcutaneous silver wire thread, lacing the wound from side to

side, and not penetrating the skin at any point, you have a suture easy of introduction, perfectly sterilizable, strong enough to bear any traction necessary to secure good apposition of the wound lips, and removable without pain at the proper time. A layer of silver foil over the closed wound, before the sterile gauze dressings are applied will add something to the protection against septic invasion.

It may be too much to say that the complete operation referred to here and described so well today by the previous speakers, Drs. McKernon and Bryant, with the blood clot dressing, will constitute the ideal, but I believe it will come to be accepted as the standard operation of mastoidectomy.

DISCUSSION.

Dr. J. A. Kennon: I would like to know what proportion of primary union you get.

Dr. J. F. McKernon: I would like to ask if you used the silk worm gut, and if that has the same objection as cat gut or silk.

Dr. MacCuen Smith: We are indebted to Dr. Reik for his interesting paper. I have never used this method of treating wounds, and it just occurred to me to ask the doctor where the blood for the clot comes from after a radical operation. In a majority of these cases the field of operation is comparatively dry, and personally I don't know where the blood would come from. As regards the abandonment, which he speaks of, in the way of antiseptic solutions, personally I have not used those solutions for quite a long while, and am glad to have had the doctor point out why I have not used them, but adopted the normal salt solution instead.

Dr. E. B. Dench: I have refrained from using the blood clot in all cases where either the sinus or the dura in the middle cranial fossa was exposed. In most of the acute mastoids that I have operated on this year, I have found pus in contact with either the dura or the sinus, and have, therefore, had but little opportunity to try the method of healing by blood clot. In one case, upon which I operated by this method, I made no attempt to sterilize the bony cavity artificially. The cavity was simply made as dry as possible, after all diseased bone had been removed, and was then allowed to fill with blood.

The only particular in which my technic differed from that of Dr. Reik's was, that instead of using the subcutaneous suture, I employed the ordinary interrupted, through-and-through suture. In this case, infection of the clot occurred, and it was necessary to reopen the wound, and pack the cavity.

I would like to ask Dr. Reik in what percentage of cases this method has proved efficacious in his practice. There has certainly been considerable written about this method within the last few years, and it must be of value. I think that a definite report, as to the number of cures by any one operator, would be most acceptable to members of the Society.

I should also like to ask Dr. Reik if he would feel inclined to employ his method in a case where either the lateral sinus or the dura in the middle cranial fossa, was exposed at the time of the operation.

Dr. H. O. Reik: I am glad to have had these questions asked for they show a practical interest in the matter. I did not include in the paper a consideration of the subject from a clinical aspect, because that has been so much better done by Dr. Blake, in his several papers.

Dr. Dench asks whether I would use the blood-clot dressing in a case where the lateral sinus had been exposed, or where an extradural abscess had been found. Dr. Bryant has given us a good answer to these questions in the case he reported last year to the American Otological Society, where an extensive mastoid operation, with opening of a subdural abscess and removal of a granulomatous mass from the dura, was perfectly healed by first intention under the blood-clot dressing. Personally, I should view such a case in this way: if satisfied that I had a macroscopically clean wound, I should not hesitate to close it under blood-clot, but, if doubtful about the healthful condition of the sinus, I would prefer to leave the wound open.

As to the percentage of successes I have met with, I regret that I can not give you exact figures. Approximately, they are about as follows: In cases of acute mastoiditis arising from acute otitis media, seventy-five per cent have healed per primam; in cases of acute mastoiditis following chronic middle ear disease, nearly fifty per cent; the greatest number of failures being in cases that originated from scarlet fever or measles.

Regarding irrigation of the wound, my experience has been much the same as Dr. Smith's; I abandoned it because it seemed to be a useless procedure and before I had learned the scientific reasons therefor that I gave today.

The suture material to be used has interested me very much. One can never be absolutely sure of the sterilization of cat-gut and, it seems to me, silkworm gut and silk are scarcely more reliable. The metallic suture can be boiled with the instruments, if desired, and there is no question of its absorbing septic matter. Dr. Blake has repeatedly closed these wounds by the application of adhesive strips. In my experience, however, it has been more difficult to secure good apposition of the margins and, consequently, the resulting scar was not so slight as when the wound had been sutured.

Dr. Smith asked me where to obtain the necessary blood to fill the cavity, which is usually fairly dry at the conclusion of an operation. There is generally sufficient oozing from the soft tissues at the time of final cleansing and suturing, but, if not, sufficient blood can be easily obtained by scarifying the wound edges of the skin.

PAPER:

A CASE OF EXTRADURAL ABSCESS COMPLICATING CHRONIC EMPYEMA OF THE ANTRUM OF HIGHMORE, ETHMOID LABYRINTH AND SPHENOID SINUS.

T. Passmore Berens, M. D.

Intracranial complications of diseases of the accessory sinuses of the nose are so rarely found during life and at least not infrequently after death, that it is hoped the following report of a case of extradural abscess complicating antrum, ethmoid and sphenoid disease will not be amiss even before this Society.

Mrs. S., age 51, consulted the writer in July, 1904. She gave a history of many years of periodic (usually monthly) attacks of violent pains in the head. These pains began with a sense of fullness in and behind the left orbit; this fullness increased to actual pain, often throbbing in character, radiating into the frontal region, the antrum, the vertex, the occiput, the roof of the mouth and the ear—amounting, in fact, to severe hemicrania. Always beginning on the left side, the pain frequently extended to the right side and was occasionally accompanied by nausea and vomiting, and at times terminated by a chill with slight, if any, temperature changes. At times these attacks were followed by a foul-smelling discharge from the throat and a sense of crackling far back in the nose. At times the attacks of pain were of such severity that morphine would not relieve, while again, aspirin cathartics and other remedies seemed to give relief. The attacks were supposed by her physicians to be connected with menstruation, which, however, was normal. This supposition was strengthened because of the marked nervous condition of the patient; indeed, one of her physicians told the writer that she had become "an impossible hysterical crank," a terror alike to her physicians and family.

Examination of the nose revealed a much enlarged left middle turbinate that occluded the middle meatus and was adherent both to the septum and outer wall of the nose. Posterior rhinoscopy revealed a whitish hypertrophy of the middle turbinate and a mild granular pharyngitis was present. A distinct suggestion of the odor of pus was remarked, but pus itself was not found. Transillumination showed on the left side a slight clouding of the antrum and a marked clouding of the ethmoid region. The right pupil showed light; the left pupil, dark. The patient was examined frequently at intervals of a few days, and while the transillumination of the antrum gave varying results and the ethmoid region invariably was clouded, yet it was only after many rigid, persistent and painstaking examinations, extending over many weeks, that a single drop of pus was finally located by posterior rhinoscopy, coming from above and behind the left middle turbinate.

The turbinate was removed under cocain anesthesia. The anterior ethmoid cells were unusually prominent and were opened, giving vent to a slight discharge of pus; further operative procedure at this time was prevented by the patient's partial collapse.

For several months following these procedures these attacks were less frequent and milder in character, although pus always could be found in the ethmoid and sphenoid regions, and the same alterations were noticed in the face on transillumination.

The attacks finally resumed their original severity, but became more frequently accompanied by chills, which were followed by sweating. No marked temperature changes were present, but there was aversion to light and sound, and the patient became extremely excitable. Exploratory procedures under ether anesthesia were advocated and finally, on May 11, 1905, in the Manhattan, Eye, Ear and Throat Hospital, a radical operation, under ether anesthesia, was performed by way of the antral route. The operation was performed as described by the writer in Transactions of this Society for 1904.

The antrum, when opened, contained a slight amount of muco-pus. The mucous membrane of the antrum was healthy except on the floor, where it was slightly thick-

ened, and at the junction of the floor with the lateral wall, well in the anterior angle, the mucous membrane was bulging and discharging pus into the antrum from a bone cyst the size and shape of a white bean. This cyst had no communication with the nose. The cyst was evacuated and thoroughly curetted, the resulting wound leaving a large opening into the inferior nasal meatus at the anterior end of the inferior turbinate. The ethmoid labyrinth was then curetted; it was badly diseased and contained much granulation tissue and pus. The sphenoid was entered through the posterior cell of the ethmoid. It also contained considerable edematous granulation tissue and pus. The bone of the posterior portions of the ethmoid labyrinth and of the anterior wall of the sphenoid was necrosed. A large cavity filled with pus was entered high up in the ethmoid region. This cavity extended from the infundibulum backward well into the sphenoid sinus, being partially separated from the latter by an incomplete bony partition that was necrotic. The cavity probably represented one large cell or a group of small cells, the partitions of which had broken down under the suppurative process and occupied the whole of the upper tract of the ethmoid labyrinth. The clearing away of the roof of this cavity disclosed the dura mater as a pulsating mass of granulation tissue bathed in pus. The bone was cleared away externally to the os planum, toward the median line to the cribriform plate and posteriorly well into the roof of the sphenoid. At all of these boundaries the dura was adherent to the bone. The hemorrhage was not great and was controlled easily, so that a good view of the dura was obtained both through the nose and through the wound. The cribriform plate was not involved and was not disturbed. A large portion of the roof of the sphenoid was missing, so that the cavity described communicated directly with the sphenoid and discharged its contents into it. The wound was packed with iodoform gauze.

The patient rallied from the operation and for two days exhibited no untoward symptoms other than pain in the orbit, radiating thence into various regions of the head. On the second day there was an accession of temperature to 102.5°. The dressings were first removed on the

fourth day and on their removal the whole ethmoid region was seen to be filled by a pulsating mass which, quite evidently, was a cerebral hernia. This hernia filled the cavity of the sphenoid and reached down into and completely filled the excavated ethmoid region until it occupied approximately the position usually occupied by the ethmoid cells and middle turbinate. The wound was packed with iodoform gauze, which was changed every fourth day, for twelve days, after which time the nose was cleaned by frequent douchings with boric acid solution. The recovery was uneventful. The temperature at no time after operation exceeded 101.5°, and reached this point but once, the elevation of the temperature coinciding with menstruation.

The patient was discharged from the hospital at the end of the third week. At this time the granulations of the dura had united with those of the septum and of the os planum so that there was a firm bridge supporting the brain. This bridge finally cicatrized and is now a healthy scar.

The technic of the operation involving the antrum of Highmore consisted in breaking down the nasoantral wall only to the level of the upper border of the inferior turbinate. The lining membrane of the antrum was not disturbed except at the location of the cyst. The oral wound was not stitched and was kept open until long after cicatrization in the ethmoid region had taken place. There has been no dryness, no crusting and no treatment in seven months.

As to the present condition of the patient, on anterior rhinoscopy the nose presents a cavity differing from a normal nose only in that the superior and middle meati are occluded by what apparently is a broad synechia extending from the nasal septum across to the outer wall of the nose at the level usually occupied by the attachment of the middle turbinate. The antrum is freely open from this point down to the superior border of the inferior turbinate, and along its whole length the inferior turbinate presents a normal appearance. The patient has gained 50 pounds since the operation and has entirely lost her nervous manifestations. Anosmia is complete on the affected side.

DISCUSSION.

Dr. J. F. Woodward: Two years ago a man from Surry, Va., consulted me about his nose. He said he had headache and night sweats, and on examining him I found ethmoid and sphenoid trouble. He was not prepared to go to the hospital and I sent him home and asked him to return again for operation. He never returned to me. What I suggest is this: He said his father had exactly the same trouble, and his brother exactly the same trouble and the same symptoms, and his brother and father both had died suddenly from brain trouble, and I heard from another brother afterwards that he died a few days later with the same symptoms of brain trouble. That was three in one family, and it is probable that they all had some brain affection following ethmoid and sphenoid disease.

Dr. Hedges: In empyema, why is it that the pain is so periodical? Sometimes severe pains will come on at 9 or 10 o'clock and continue till 1, and the patient will be free from pain for the rest of the day. I have seen many cases treated for neuralgia and found the whole trouble was due to the presence of pus. I cannot see why the pains come on so periodically. I would like very much to hear from some of you as to the solution of that.

Dr. T. P. Berens: Dr. Woodward's history of his case is very interesting. I know of a case, I believe to be published shortly, in which there was a possible brain abscess diagnosed complicating a frontal sinus empyema. The frontal sinus was explored and the patient made a rather eventful recovery, in that the convalescence was retarded by the appearance of temperature, but he did recover, and his physician then stated that he thought his first diagnosis of brain abscess was wrong. After a year or so this case died, and at the post-mortem the brain abscess was found. I simply mention this case as confirmatory evidence of the probable correctness of the diagnosis in Dr. Woodward's patient.

In regard to the periodicity of the attacks of pain in sinus cases, I suppose it is caused by the cavity filling up with pus, taking a certain time to fill and then forcing

a drainage for itself and thus by relieving the pressure it necessarily relieves the pain. As soon as the pressure stops the secretion commences to accumulate again, till at the end of a certain number of hours the pain comes on again.

PAPER:

FIBROMATA OF THE NASOPHARYNX—OPERATION, RECOVERY.

JAMES LIGON KENT, M. D.

On account of their proximity to vital centers, their rapid endless growth, and the frequency of dangerous epistaxis, postnasal fibromata usually prove fatal unless subjected to successful operative interference. In view of which Diffenbach has recently said that "the surgeon is almost compelled to choose between one of three conditions, choking to death of the patient during operation, bleeding to death at the time of the operation, or not finishing the operation." I know of no more serious condition presenting itself to us for treatment.

I present the following report of a case which came under my care recently, to encourage those who may be confronted by similar ones. J. M., male, aet. 17, of good family history, has suffered with "catarrh" all his life, has had "nose bleed," frequently for years, especially from the left nostril, but this never was alarming until about the first of last September, when he began to experience great difficulty in breathing through his nose and to have frequent alarming hemorrhages, the blood "gushing from the nose and mouth" and "amounting to half a gallon on one or two occasions." He had lost 40 pounds in weight in the last three months and was alarmingly anemic and weak. He had the characteristic "frog-face" and "dead voice."

On examination, the anterior nares were practically normal. Through the right tonsil a smooth pale pink tumor could be seen; far back on the left I could see what I presumed to be a prolongation of the same tumor extending as far forward as the middle of the inferior turbinal. When the patient opened his mouth a smooth

pale pink tumor, the size of a pullet's egg, could be plainly seen pushing the soft palate far forward. It could be moved but little, and that only from side to side, and by palpation was found to be very firm and attached by a broad pedicle to the basilar process close up to the perpendicular plate of the ethmoid bone. There was no bleeding produced by my examination.

Diffenbach's gloomy prognosis "haunted me" and I should have gladly tried some conservative treatment, such as injections of monochloracetic acid, as advised by Harris, Coffin and others, but for the patient's condition being too alarming to justify any procedure which would take much time.

On November 29th, he was admitted to a sanitarium, put in bed and given fifteen minims of solution of adrenalin chlorid every four hours. Under this treatment his pulse improved wonderfully in quality and there was no recurrence of epistaxis. On December 1st, under chloroform anesthesia, with his head extended far back over the end of the table and the mouth held as wide open as possible with a gag, I introduced a very strong tonsil snare, armed with a "second guitar string," carried the loop behind the tumor (guiding it with my finger) and the snare to the front, until I was certain it had reached the pedicle. I seized the tumor with a volsella, which I gave to an assistant to hold, and tightened the wire slowly and, after about twenty minutes, cut through the pedicle close up to the attachment, my assistant delivering the tumor.

There was a momentary gush of blood, but it amounted to less than one ounce, for I quickly applied pressure to the cut surface with a compress of gauze held in an adenoid forceps. Fearing that there would be postoperative hemorrhage, I applied a postnasal tampon, which I left in forty-eight hours. There were no untoward symptoms following the operation, but when I was able to make my first satisfactory postnasal examination after the operation I found another fibroma arising from the arch of the left nostril between the site of the one just removed and the Eustachian eminence, practically filling the posterior half of the left nostril.

I allowed this to remain until the patient could have

an opportunity to improve some in health, which he did with phenomenal rapidity, for on December 20th (twenty days after the operation) he returned to me, having gained twenty-five pounds in weight, with good color, appetite, etc. On that day, under cocain anesthesia, I was able to introduce a snare through the nostril, encircle the pedicle at its base and cut through it. There was for a moment a decided gush of blood from the nose and mouth, amounting to four or five ounces, but pressure of my index finger introduced through the mouth, soon stopped it and it was not necessary to use a tampon. This tumor had to be delivered through the mouth also. The first tumor measured 1½ in. by 1½ in. by 1 inch and was pear-shaped; the second measured 1¾ in. by 1 in. by ⅜ in., and was much the shape of the nostril which it so snugly fitted that it was difficult to pass the wire around it.

I have not seen the patient since the day after the operation, but his physician reports that he continues to improve.

I shall be greatly surprised if these tumors recur, for they were removed absolutely at their attachments, and twenty days after the removal of the first one it was very difficult to make out its site. However, I shall keep track of the case and report the fact if there is any recurrence.

DISCUSSION.

Dr. MacCuen Smith: Do you think that the adrenalin chlorid you used was actually of use?

Dr. Kent: I mentioned the administration of it for what it is worth. I did not use it in the second operation, and I had an abundance of hemorrhage for a few seconds; but the second tumor had a very much more vascular appearance than the first one; it was streaked with blood vessels very much larger than the blood vessels of the larger one. As for the effect of the adrenalin chlorid, I don't know that it amounted to anything, but I know that I did have much more blood when I did not use it than when I did use it.

Dr. C. W. Richardson: I think it falls to the experience of all of us to meet with this form of growth once

in a lifetime. I have seen only one, and that one I saw about twelve years ago. It was a peculiarly interesting one because it had a very peculiar form of attachment. It was a double pedunculated fibroma, having two characteristic, well-defined pedicles with attachments to a body of the growth nearly one-half inch removed from one another. I reported this case at the first Pan-American Congress, showing a picture of the growth. The growth was as large as the larger one the doctor presents here, one pedicle was quite large, the other almost a ribbon. These I removed by the snare. It came away very readily and there was little bleeding. I think that probably the safety in these cases is in getting the pedicle away from its attachment rather than removing the pedicle lower down. I think if you get the snare well up, so as to completely remove it from its attachment, the hemorrhage would be less than where we cut the pedicle lower down.

Dr. S. MacCuen Smith: I would like to ask Dr. Kent if he feels the adrenalin chlorid was the cause of success in causing little hemorrhage in this case. My experience is that with the use of the cold snare there is very slight tendency to hemorrhage.

Dr. H. L. Myers: In contrast to the case just reported as to the bleeding, I think it would be of some interest to report one that came under my observation. The tumor was in two lobes, and perhaps as large as those two pieces. The tumor filled the postnasal space and the oropharynx. The boy, who was about twenty-one years of age, was very emaciated, suffering from asthma, and was in a pitiful state. I attempted to remove this growth by the galvanocautery snare. I succeeded in getting the wire back in the postnasal space by passing it through the nasal cavity by means of a string attached to a wire and pulling it through from behind and succeeded passing it around the growth by my finger in the postnasal space. The boy could stand a great deal of manipulation in his nasopharynx, and I removed a piece almost as large as the largest piece shown today without a particle of bleeding, but, owing to the long sitting, I did not attempt to get any more that day. At the next sitting, three or four days after that, I succeeded in taking the

main portion of the growth. I used the galvanocautery snare. I expected no bleeding, but my expectations were blasted, for about the time I got through the growth, although I was working very slowly, there was a tremendous gush of blood from the nostrils, and this only checked up a little bit, and I waited for a few minutes, hoping it would stop. He had high pulse, and I sent for the ambulance, expecting to have to tie the carotid, but I stopped the hemorrhage by packing, and the boy made an uneventful recovery. I believe it is said that if you remove those fibromata about the age of puberty they are not likely to recur. I saw the boy six months after that and he had had no recurrence. The important thing was that we got it off close to the pedicle. I rather think, however, if I had to do another one of those operations, I would prefer to tie the external carotid artery on one side of the growth before I attempted to remove it. I believe it is an excellent thing, and feel that you can get it out with some satisfaction; the patient is not likely to die on your hands.

PAPER:

DUAL ACUTE OTITIC CEREBRAL ABSCESS.—OPERATION.—RECOVERY.

CHEVALIER JACKSON, M. D.

The writer has devoted himself to the study and perfection of details in surgical technics in the operative work of this case, the drainage, dressing, etc. The observation and analysis of symptoms were left to Dr. John W. Boyce, who kindly sent me the notes which are inserted. To this division of labor the successful outcome is in large measure due.

CASE.—Mr. A., aged thirty-three, carpenter by occupation, was sent to me by Dr. T. S. Anderson for mastoid operation. There was a history of left middle ear suppuration of ten days' duration following earache subsequent to a blow on the side of the head. As Dr. Anderson had only been called to the case that same day, the preceding local conditions were unknown. But the patient and his family were certain as to the duration of the ear symptoms. His temperature was 100.8°; pulse, 76; respiration, 20. The mastoid was slightly tender, the posterior superior meatal wall was sagging, pus of only laudable odor was escaping from a high membranic perforation.

Mastoid operation performed on July 10, 1905, at the Eye and Ear Hospital; with the assistance of Dr. Anderson and Dr. Ellen J. Patterson, I opened the mastoid, which contained pus in scattered locations, apparently isolated from each other. The tip cells were normal. The bone was in no location eroded through to the dura, though there was some softened bone in both tegmina. After it was curetted away, there was a layer of apparently healthy bone remaining, the tegmen mastoideum having a particularly good layer of normal bone.

The postoperative pyrexia went to 100.6°, subsiding to normal after a cathartic on the second day. Pulse, temperature, and respirations remained normal for a week, the patient being on full diet and going about the hospital.

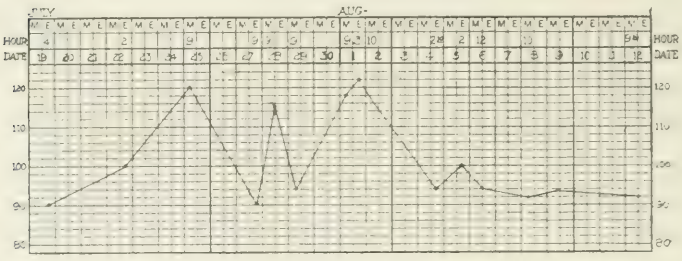


Fig. 1, Chart.

On the eighth day after operation (eighteenth of disease) he was taken to his home in the suburbs.

Dr. Anderson reported that on the next day the patient became unconscious and had a convulsion. On the tenth day after the mastoid operation we ordered him brought back to the hospital.

The later history of the case is best told by Dr. Boyce:

"Patient was readmitted at 11 a. m., July 19, 1905. The history was that he had 'seemed queer' on going home. On that morning he had suddenly become unconscious while alone, and had had four general convulsions before arriving at the hospital. The predominant symptom was the patient's mental state, which was one of semi-stupor, with confusion of ideas, abolition of memory, and absolute inability to fix his attention. Voluntary movement and reflexes seemed equal on the two sides; the pupilary reflex being rather sluggish. The face and head were noted as asymmetrical. It was said that the patient had always been peculiar. The pulse showed a tension of 88 millimeters, which we regarded, at that time, as low, but which subsequent observation shows to be about the normal standard in this particular individual. There was considerable leucocytosis. The urine was highly acid and showed an unusual quantity of indican.

"Calomel (10 grains) was administered; patient slept soundly all night, and awoke perfectly rational. This was not the slight degree of better or worse that may be observed from time to time in any mental condition, but a complete disappearance of all symptoms. At this time the diagnosis of organic disease within the brain was ruled out from consideration.

"On July 21st, the third day in the hospital, patient seemed in good condition, except for moderate pain above the eyes, and in left side of forehead. A foul odor of the breath was present.

"On the fourth day, on account of failure of appetite, which had previously been excellent, patient was put on light diet. Headache continued moderate in amount. No new symptom was noted until the sixth day, when his mind was again confused, and the pain in head became severe. In the evening while taking calomel, he vomited a little. The next day there was some slight improvement in the mental condition. Eye grounds were examined by Dr. Glendon E. Curry, and found normal. About noon he vomited a second time. The pulse tension had been slowly rising, and now stood at 118. On July 26th (twenty-sixth day of disease), his mind seemed clear, but there was great difficulty in expression. Examination showed a well-marked case of optic aphasia. He could read time correctly, but could not name the watch; called the pen a 'poidon'; a bottle a 'womn'; would not attempt to name a key, said: 'I know what it is, but I don't know what it is'; a rose he called a 'flower'; asked as to kind, he said it was 'a sort of mosette'; but was evidently dissatisfied with the word. After this examination he lay with back of hand to forehead as though exhausted by intellectual effort.

"On percussion, dullness was unmistakably present on the left side. It was noted that the pulse was slow in proportion to the temperature. Pain had continued from the second day, but was located always in the frontal region.

"Operation was decided upon, mainly on the strength of the former bone infection, the steadily rising blood pressure, and the optic aphasia, which is a symptom of utmost importance, not only for diagnosis, but also for localization. Subsequent study of the subject convinced me that great weight should have been accorded to percussion dulness, the high degree of leucocytosis, and to the characteristically foul odor of the breath; but they did not figure to any extent in the decision in this case. The vomiting which had occurred was slight, and, I believe, accidental, and not in any way diagnostic. The pain, because of its localization, tended rather to mislead than to aid us."

Second operation. First abscess evacuated July 26, 1905.

—With the assistance of Dr. T. S. Anderson and Dr. Ellen J. Patterson, chloroform being administered by Dr. Helen F. Upham, I explored the brain.

A tongue-shaped flap was turned forward in the scalp over the parietotemporal region. Sufficient periosteum was elevated to permit making with trephine and rongeur an opening four cm. in diameter in the skull, its centre being about three cm. above and two cm. back of the centre of the external auditory meatus. The dura and cerebral cortex looked normal. A dural flap was reflected forward, and the exploratory canula was inserted forward, downward and inward to the distance of two cm. and its blades separated. About four drachms of pus of dark brownish color, and of only laudable odor, with floating brain sloughs, poured out. There was no capsule, the exploring canula passed first through normal brain tissue, then through a zone of softened reddish brain tissue, then into the pus.

This difference in tissue and absence of a capsule were quite apparent to the touch as transmitted by the dilating forceps. Spreading the blades every five mm. as they passed inward showed the nature of the tissues to the eye also.

The cavity was not washed out, but the surface of the brain meninges, and the wound generally were irrigated with a 1:5,000 bichlorid solution, and then several turns of gauze were folded into the cavity, the ends extending out through the wound for drainage. The wound was dressed daily.

(Dr. Boyce) "After operation, patient rested well. When seen the next morning he had great difficulty in answering questions. It seemed that there was some mental impairment, but that the main difficulty was aphasic. The right (opposite) side of the face was expressionless. There was no diminution of strength in the right hand, but a certain difficulty in coordination. Blood pressure fell below 90 on the twenty-seventh day. On the twenty-eighth, it was again at 115, but on the twenty-ninth was down again to 95. Meanwhile, there was some complaint of headache. Mind was uniformly better than on the day after the operation; the aphasia continued unchanged. The control of the right hand was slowly improving. Appetite good.

"On the thirty-first day of the disease, the patient moaned a great deal, vomited once, and mental condition was distinctly worse than it had been since operation. On the thirty-second

day the conditions were still worse. Pulse tension stood at 118 in the morning; in the afternoon 122, a trifle higher than it had been before the first operation. On the strength of this symptom, with the gradual failure of mental condition after a period of improvement, further exploration of the brain was advised."

Third operation. Second abscess evacuated August 1, 1905. —Acting upon this advice of Dr. Boyce, I dilated the channel to the abscess cavity and searched for a communication to a pus pocket. Failing to find one, the brain exploring forceps was passed forward and somewhat downward in a direction parallel with the temporal gyri. The forceps was felt to pass through about a centimetre of brain tissue of normal resistance, before resistance ceased and the pus of the same laudable odor and the same brownish, hemorrahgic color as that of the first abscess began to flow. About an ounce in all escaped. Cigarette drainage was used from this time on.

(Dr. Boyce) "After evacuation of this second abscess, pulse tension came down to normal; urine was scant for a considerable period, and the patient was exceedingly apathetic, but rested better than previously. The subsequent history of the case is that of continuous improvement, the change in the mental condition being very plain in spite of the difficulty in examination caused by the aphasia. There was at several times complaint of pain in the head; twice or three times, confusion of mind, and on one occasion actual delusions. The blood pressure several times was as high as 100. These symptoms all proved transitory, and are attributable, I think, to the difficulty of maintaining perfect drainage in the mushy tissue of the brain.

During convalescence, the patient emaciated to an extreme degree, and required special feeding."

The patient left the hospital the last of August, twenty-nine days after evacuation of the last abscess. The hernia cerebri left an elevation of fibrous tissue about the size of half a walnut. Six months later he was reported by Dr. J. S. Demuth, of Crafton, to be going about in fair health, with rapidly returning speech control. About a month after leaving the hospital he had a pneumonia, with delirium, then coma. When he awoke from coma, increased aphasia, hemiplegia, and hemianopsia were noticed. All these symptoms yielded to iodides, potassium and mercuric.

Bacteriological Report by Dr. Joseph H. Barach.—From the mastoid pus, diplococci in pure culture. From the first brain abscess, streptococci in pure culture. Second abscess, same.

Remarks.—At the first (mastoid) operation the original septic focus was removed cleanly down to healthy bone in all directions, and there was no discoverable patch leading therefrom to any other diseased focus. The patient apparently recovered, the symptom triad, temperature, pulse and respiration was normal, strength was returning, and the man was walking about. In view of these, the writer felt justified in attributing no importance to a slight taciturnity and hesitation in answering, especially as the patient's friends said he was "always a little queer," and that he had been a stammerer, and that all his life he hesitated for a word at times. The sudden onset of serious symptoms, unconsciousness, convulsions, semi-stupor, confusion of ideas, loss of memory and wandering off from the subject, would lead one to suspect that there had been either a sudden spread of a quiescent old focus, due to a jar, as in falling, or an onset of a new focus, due to septic embolism or thrombosis. The findings at the first brain exploration and the dual lesion demonstrate the correctness of the latter view.

Five facts are to be considered in deciding the pathology of this case, namely: The ear suppuration; the blow on the head; the zone of red softening surrounding the abscesses; the recovery, under specific treatment, from a subsequent threatening recurrence of cerebral trouble; and the finding of diplococci in the mastoid wound, of streptococci in each of the brain abscesses, in each of the three instances the organisms being in pure culture. That the original brain lesion was not a gummi must be conceded, because there were no cerebral symptoms prior to the formation of pus. But that syphilis was a factor in the acute disintegration of brain tissue seems likely.

The brownish color of the pus and the brownish red and gray brain sloughs extruded later, show the pathology of the lesion was the breaking down and suppuration of a hemorrhagic encephalitis, probably originating as an infective thrombophlebitis. Infarction by septic embolus is a possibility, but seems less plausible.

The relief of the symptoms followed by their return, might seem to point to the possibility of the second abscess being but a pus pocket, due to defective drainage and not to a separate or original embolic focus. In the writer's opinion this is not an argument against the duality of the lesion, though he admits the possibility that the collapsing of the normal brain tissue may have prevented drainage of a part of a single cavity, and that this collapsed normal tissue may have been in the track of the exploring instrument. The relief of the symptoms the writer considers to have been due to the relief of pressure from the evacuation of the first abscess, the pressure again increasing from increase in size of the second abscess. He must admit that it is impossible to be absolutely certain in any case that channels of communication between brain abscess cavities do not exist, but even when present they are as likely to have originated after the abscesses have formed as to have been pioneer paths of pyogenic extension. The much larger size of the second (in order of evacuation) abscess would argue against its having been secondary in order of formation, but granting that it were, clinically the lesion is the same.

The blow on the head thought by the relatives to have been the cause of the median otitis, if a factor at all in the subsequent abscess formation, could have been so only by lowering the tissue resistance. There was no evidence of bony fracture, nor of trauma by which infection could have entered. However, this coincidence of a blow, a suppurative otitis, and a brain abscess, has occurred once previously in the writer's personal experience, and a number of such cases are recorded in the literature.

The variance between the organisms found in the mastoid and the brain pus does not seem a positive argument against the etiologic relation of the lesions, a sufficient time had elapsed for the invasion and victory of another organism.

The heterolateral paretic symptoms in the distribution of the seventh nerve evidenced irritation, but not breaking down of the gyrus centralis anterior, rather than pachymeningitis at the dural emergence. This might have been of localizing value if it had been so marked as to exclude preceding habitual asymmetrical muscular activity.

Perhaps the most valuable lesson to be learned from this case is the warning it conveys to be on our guard lest while

resting content with maintaining drainage from one brain abscess cavity, a second brain abscess may be killing the patient, though showing but slight symptoms. The writer feels confident that, had not Dr. Boyce been studying this case closely, the necessity for the search for a second abscess would not have been realized, and the case would have swelled the list of the many brain abscess cases fatal through failure to recognize the frequently multiple character of these lesions.

Another warning conveyed is that an acute brain abscess may develop in a short time. Most of the literature deals with chronic abscesses, which are often of months' or even of years' standing. The effect of this, judging by opinions encountered by the writer in consultations, has been that many able men want to rule out brain abscess in any case with only a few weeks' otorrhea. In this case only nineteen days elapsed between the initial otalgia and the convulsions and other undoubted cerebral symptoms. From the onset of the otorrhea only fifteen days elapsed. The general epileptiform convulsions in this case are rather unusual.

Another point of especial interest is the misleading disappearance of all urgent cerebral symptoms after the administration of calomel. We must be on our guard and remember that a man with a brain abscess may have intestinal autotoxemia, as well as one without, indeed he is even more likely to have it, on account of the damaged innervation of his general eliminative apparatus, his torpor and his constipation. It does not seem possible that a single dose, even though it was large, of calomel, and in so short a time, could have acted as subsequently mercury biniodid did.

Whether the slow evacuation unintentionally resulting from the opening the second abscess after an interval of several days, assisted in ultimate cure, is a question.

Another valuable lesson would seem to be the indication for potassium iodid and mercury biniodid in the postoperative treatment of acute abscess, especially upon signs of recurrence of cerebral trouble. Evidently there was a serous meningitis, with possibly some fibrinous exudate, complicating the pneumonia, but the whole case does not seem free from luetic suspicion.

Cigarette drainage was found more satisfactory than anything the writer has ever used, though it is far from perfection. It required daily changing, and when the periabscess

zone of red softening was breaking down there were at times indications for even bi-daily insertion of fresh drainage. In two weeks a fistula was formed, after which the drainage was shortened daily and was dispensed with on the twenty-first day after the operation.

Packing the cavity with gauze or even wicking the wound has never proved satisfactory. The writer has never yet removed gauze drainage from the brain that pus did not follow it out. It had been acting as a dam, not as a drain. Of course it had maintained a fistula, which was of advantage, but there is always some adhesion to the walls of the fistula. There is no adhesion to the cigarette drain and a large, smooth walled fistula is soon established through which brain sloughs and debris are extruded at each dressing, much as clots are expelled by the post partum uterus. The less meddling with the interior of the brain lesion, the better are the results, in the writer's experience. Irrigation may scatter infection and

Fig. 2. Dilator.

it is unnecessary. Shortening of the drainage only after a good fistula had been formed, assured efficient drainage while the fistula was healing from the bottom.

The insertion of the little finger into the abscess cavity was avoided in this case, and the writer will never employ it again. He feels certain that there is great risk of disturbing the protective inflammatory adhesion of the meninges to each other by which they obliterate the arachnoid space around the meningeal opening.

The exploratory dilator shown in the cut has given the writer great satisfaction. Its blades are like two grooved directors, giving the equivalent of a canula for insertion, as the spring holds the grooved surfaces closely in apposition. They can be separated from time to time at various depths; probably every half centimetre, after the first centimetre, is about right. Cheesy pus and softened brain tissue is forced outward between the separated blades by the expulsive force of the brain. The tract can be inspected by the ordinary electric headlight, or the encephaloscope may be passed between the separated blades, as may also the drainage or dressings. The dilator is always inserted closed, and it is a coarse hand indeed that would force it through a normal ventricular wall, while a sharp knife conveys no sensation of resistance. There are rare cases when it is desirable to open a ventricle, but in all other cases it is a disaster. At subsequent dressings the dilator in gentle hands will follow the drainage channel without making a false passage.

The ratchet trephine shown was devised a number of years ago by the writer. It will remove a button of bone in about half the time required with the old instrument, though it seems awkward at first to those accustomed to the old trephine. The shank is not hollow, and it can be readily taken apart, so that it is thoroughly cleanable.

The chisel with rounded corners and rounded basil is convenient for removing bone quickly and exposing the dura safely, in getting a start for the rongeur. A man must be a genius in awkwardness to injure the dura with this instrument.

In the technics the value of a tongue-shaped flap, base forward, and independent of the mastoid wound, was demonstrated. The after-management of the wound was rendered painless and highly efficient as to drainage.

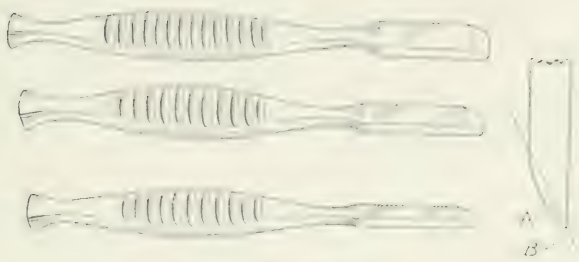


Fig. 3. Chisel.

Had no pus been found, the clean field and primary union would have been an even more forcible demonstration of the advantages of this method. With this in view, the writer always prefers, when the symptoms are not urgent, to explore the brain at a subsequent clean operation, with field, hands and armamentarium free from suspicion of infection from the mastoid operation.

Another point previously advocated by the writer was demonstrated again, namely: The value of a brain opening posterior to the abscess as assisting drainage by gravity in the dorsally decumbent patient. While this involves traversing a slightly greater amount of normal brain tissue in reaching the abscess, yet this should not outweigh the importance of efficiency of drainage, which is to-day the greatest problem in the surgery of brain abscess.

Résumé.

The points of especial interest in this case are:

1. The importance of always bearing in mind the possible multiplicity, or at least duality, of brain abscesses.
2. The value of sphygmomanometric charts in determining the probable presence of (a) brain abscess; (b) reaccumulation of pus in the cavity, or, (c) another abscess.
3. The difficulty of diagnosis of aphasia in a stammerer, and especially one who, when not stammering, habitually hesitated for a word.
4. The history of a blow on the head.
5. The recovery, under specific treatment, from a subsequent threatening recurrence of cerebral trouble.

6. The development of a brain abscess in nineteen days from the initial otalgia, fifteen days from the onset of the otorrhea.

7. The general epileptiform convulsions.

8. The postcathartic disappearance of cerebral symptoms.

9. The value of the cigarette drain.

10. The value of a brain explorer which conveys to the trained touch evidence of the normality or diseased character of the tissues traversed, as compared to the knife, which goes through everything, even the ventricular wall, without conveying sensations of differences.

11. The advantage of a tongue-shaped flap, base forward, and independent of the mastoid wound. This advantage would have been still greater had there been no abscess, as primary union would have been assured.

12. The advantage, where possible, of making the evacuating opening posterior to the location (when known) of the abscess, to gain the help of gravity in drainage in the dorsally decumbent patient.

PAPER I.

SYMPTOMS AND TREATMENT OF THROMBOSIS OF THE LATERAL SINUS AND JUGULAR VEIN, WITH REPORT OF CASES.

B. R. KENNON, M. D.

In considering the symptoms of the affection under discussion, I think that much has been written that is confusing, even misleading.

Many observers having laid down too hard and fast rules particularly in regard to the temperature curve and the occurrence of chills.

These observations are based on fifteen cases, five of which have been in my own practice and will be described in detail later.

Among the symptoms and signs which have been enumerated are chill, temperature, pulse, respiratory, digestive, cutaneous, mental and eye symptoms and those appearances peculiar to the mastoid and neck.

(1) *Temperature.*—This is the most important of all the symptoms and signs of sinus and jugular involvement and usually the only one that can be depended on.

When characteristic the sinus should be opened regardless of other symptoms.

The temperature in this affection is that peculiar to pus absorption and is characterized by a sudden rise followed by an equally sudden fall. This very characteristic temperature curve has led to much error in the description of this our most important symptom, for a glance at the charts shows in several instances a gradual rise followed by a gradual fall extending over a period of from 6 to 12 hours and in some cases as much as twenty-four. Another fallacy regarding the temperature is that it should reach 104, 105 or 106. If we wait long enough before operating the temperature will reach the above figures, but there are

many cases especially after the mastoid has been cleaned out where a temperature ranging from 101 to 103 is sufficient reason for us to open the sinus.

(2) *Chill.*—This may vary from a pronounced rigor to merely chilly sensations of the extremities and may escape detection unless carefully watched for. I think the importance of this symptom has been overrated. If present it is, perhaps, as important as the temperature, but the point I especially wish to emphasize is its frequent absence, occurring in only one of the five cases here reported.

(3) Respiration is dependent on the temperature, being rapid when the temperature is high and going back to normal or nearly so when the temperature reaches normal.

(4) Pulse is usually somewhat rapid and when the temperature rises, often goes to 140 or 150 and scarcely ever gets back to normal even though the temperature does so.

(5) *Cutaneous.*—When there are chills they are always followed by sweating but when there is no chill the skin is parched and dry. The yellow hue of the skin is not observed until very late in the septic process.

(6) *Digestive.*— The fetid breath, cracked lips, sordes on the teeth, have often led to a diagnosis of typhoid as occurred in Case II. of this series.

(7) *Mental.*—The mind is not especially affected, being influenced as in other diseases by the temperature.

(8) *General.*—In the early stages of the disease, when the temperature is low, the patient feels very well and we are soothed with the false hope that he is better, but if the condition is not relieved there is rapid loss of flesh and strength and the marked emaciation and debilitation are striking.

(9) *Eye Symptoms.*— Optic neuritis in the cases coming under my observation has been very rare, indeed it was more frequent in cases of epidural abscess than in sinus thrombosis.

(10) *Local Symptoms.*— I must confess to my inability to judge of the contents of the sinus from knowledge gained by an inspection of the mastoid, so cannot understand the statement that an edema over the mastoid speaks for sinus thrombosis, nor have I ever felt the cord-like swelling and induration over the course of the jugular. After the sinus has been exposed much stress has been laid on its appearance and "feel' as an aid to diagnosis.

A discoloration of the sinus is of the slightest significance from a diagnostic standpoint. The presence of granulations on the sinus wall argues against its involvement, for this is a barrier which nature has thrown out between the infective process and the blood current. The aid in diagnosis gained by a palpation of the sinus is in many cases misleading and I have seen uninvolved sinuses opened and involved ones left alone by relying on this sign. Furthermore, granulations on the sinus wall greatly lessen the ability to detect by palpation the presence of a thrombus. Nor has the experiment of Dr. Fred Whiting been of any aid to me; should the sinus be clotted, especially with a parietal thrombus, I think that this experiment is positively dangerous, for by the firm pressure and milking required we may force particles of infected matter into the circulation.

The presence or absence of pulsation is of no significance.

Treatment.—Let me emphasize in the beginning the great necessity of rapid operation, for these patients are very frequently exhausted by the disease before a diagnosis can be established, and they bear the anesthetic badly. I think that all of us have a too great respect for the sinus, making us put off opening it longer than we should. If the temperature has been indicative of sinus involvement we should open it at the time of the mastoid operation even though its appearance and feel do not indicate the presence of clot.

It will be found in many cases that the bony wall is softened and frequently the sinus exposed by the infective process, in which case further exposure for inspection and treatment can be most readily gained with the ronguer. While I know that the rongeur subjects the sinus to more or less pressure, I think it decidedly a safer instrument than the chisel. If we use the latter it requires the greatest care thereby sacrificing valuable time. Another objection to the chisel is the great danger of accidentally wounding the sinus either with its edge or by driving a spicule of bone through the wall. An accidental wounding of a sinus which bleeds is most unfortunate because it is done at a time when the field is not prepared, the flow of blood

greatly hampering us in any further work in the wound and obscuring a proper inspection of the sinus. Should the bony sinus wall not be eroded or softened, the chisel, cutting at a tangent to the vessel, is the instrument par excellence to secure an initial opening.

When the sinus has been sufficiently exposed, and I mean by this from the knee, or above it if necessary, well down toward the bulb, and if it is decided to open it, two gauze rolls are made, one placed above and the other below where we wish to make pressure. The operator takes one and the assistant the other, but no pressure should be made until there is free bleeding for we may thus detach pieces of the clot and force them away from the wound, whereas if the blood is allowed to flow out of the wound, in the direction of least resistance, these particles will be swept out of the circulation. After free bleeding is established from either direction pressure can then be made, the interior of the sinus wall examined and the other end looked after. An accident to be avoided in a thrombosed contracted sinus is going through both walls of the sinus and entering the dural cavity. I have seen this accident happen.

Should the thrombus be situated either primarily or secondarily in the bulb we should at once expose and resect the jugular vein, for, from the anatomic arrangement of the parts, the bulb cannot be efficiently curetted and it is dangerous and unsurgical to loosen in a blind tube an infective clot which may be swept toward the heart. Anyone who has seen the alternate filling and collapse of the jugular after its exposure cannot fail to be struck with the negative pressure, amounting to suction during inspiration. It is unnecessary to describe in detail the resection of the jugular vein, but I wish to call attention to one or two points. The first and most important is rapid operation, 30 minutes being sufficient time in any case in which to resect the jugular.

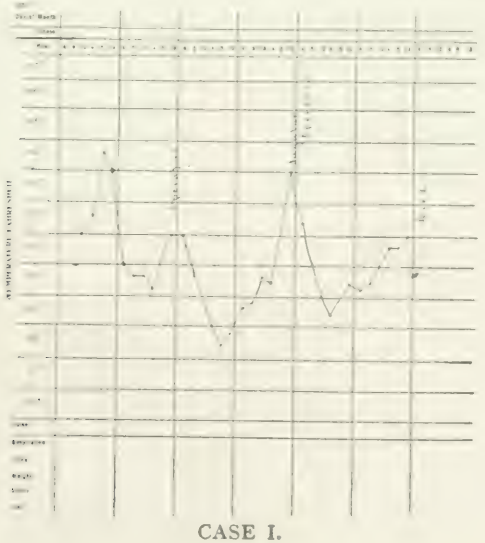
In preparing the neck the greatest gentleness must be employed and in no case should there be violent scrubbing as by this means particles of infective material may be loosened and carried into the circulation. Instead of removing the vein from the base of the skull to the clavicle, thus leaving the infected upper end to drain into and infect the neck wound, I have in my last cases resected the vein

only from the facial downward and brought the upper end out of the upper angle of the wound, by this means successfully avoiding infection. In every case in which the neck wound has been closed at the time of operation it has become infected so I now leave it open and pack it, drawing it together with adhesive strips at the first dressing.

Case I.—J. B., colored, aged 10. Walked into my clinic at St. Vincent's Hospital August 9, 1901. The child's mother stated that a companion had run a stick into the patient's ear while he was asleep three weeks previously, since which time the ear had been discharging. There had been much pain for three days prior to my seeing him. Otoscopic examination revealed a profuse purulent discharge which upon being wiped away showed a large perforation in the posterior inferior quadrant of the membrana tympani. Mastoid exquisitely tender and considerably edematous. Temperature 102, pulse 95.

Patient was admitted to hospital at 3 p. m. and canal ordered douched q. 2 h. bichlorid solution 1—4000.

The temperature was 104.5° at 6 p. m. but gradually receded to 100.2° in the next twelve hours. Operation 6 hours later disclosed mastoid antrum and cells filled with granulation tissue and pus. The sinus groove was not softened or discolored, so the sinus was not exposed.



CASE I.

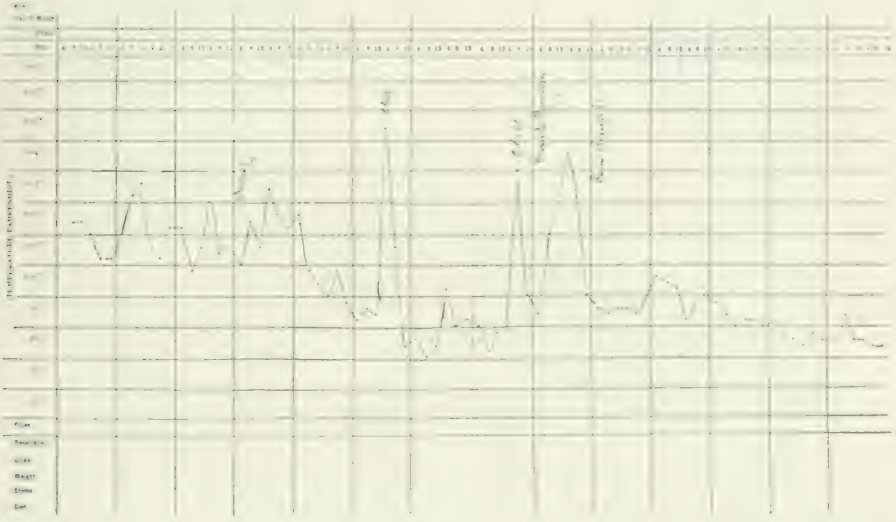
By 10 a. m. on the day following, the temperature again reached 104° and it was decided to expose and open the sinus.

Operation under chloroform. Bone removed from over sinus with chisel and rongeur for about 1½ inches. The sinus was then slit with a knife and found to be occluded with a firm partially organized clot extending for about 1 inch beyond the knee in its torcular end. This was removed with a malleable curette and free bleeding established. I now tried to establish the circulation from below but found this impossible although the bone was removed well down in the direction of the bulb.

The jugular was now exposed and its wall was found to be thickened and its lumen occluded down to the entrance of the facial. It was tied off just above the clavicle and cut between the two ligatures and was excised at its exit from the jugular foramen. The wound was closed and the patient returned to bed at 3:30 p. m. His condition was very good until 12 o'clock the next day, the temperature then being 102, when the patient suddenly collapsed and died in about two hours. I have always been unable to account for this sudden collapse and death. An autopsy could not be obtained.

Case II.—I was called April 1st, 1902, to see Philip C., aged 7. He had lived up to six months previously in a malarial district and had had frequent attacks of chills and fever. Two days previous to my first visit the child had complained of slight earache and had a temperature of 104°. The next day he suffered almost continuously with nausea and vomiting with a temperature of 102 in the morning and 104 in the afternoon. I was now called and found the child listless and fretful and still vomiting everything taken. He complained of chilly sensations during the day and the temperature was 102.4. The mastoid showed only moderate tenderness. Otoscopic examination showed a bulging membrane with a very small perforation so that the membrane was thoroughly divided under nitrous oxide and a Leiter coil applied. The next day the temperature reached 103.6° and I strongly advised operation as I did every day until it was finally consented to. For the next two days the condition was unchanged the temperature remaining between 102 and 103, but for the following 48 hours the gen-

eral condition and temperature curve were much more favorable, but this improvement was followed by a marked chill and temperature of 105.4 with sudden return to normal there to remain for 24 hours when he had another chill and temperature of 104.



CASE II.

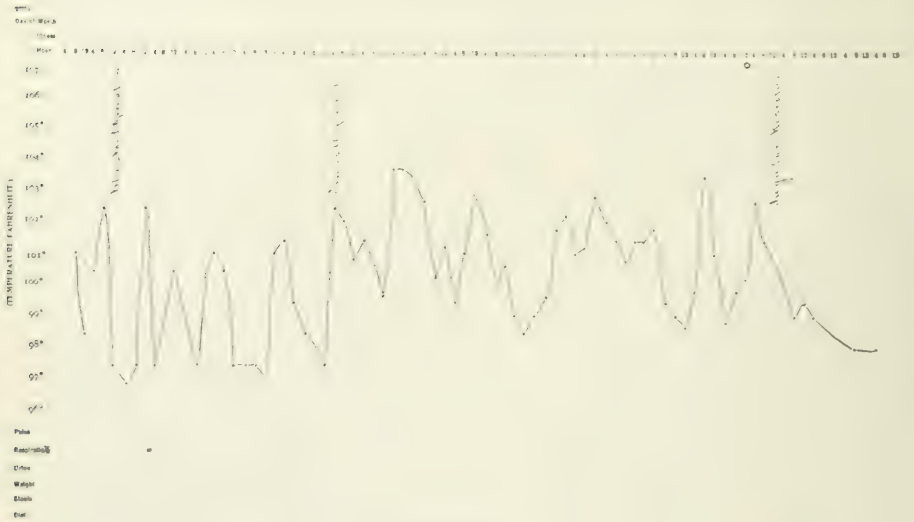
I would say in extenuation for this delay that I had strongly advised operation daily for seven days.

It was now consented to, and exploration of the mastoid showed a very much involved process and an epidural abscess on the anterior sinus wall in front of the knee. The wall itself was not discolored and had a normal "feel" so it was not opened; the amount of pus already found was thought sufficient to account for the symptoms, but twelve hours after the operation on the mastoid the patient had another chill followed by temperature of 104.5°.

The sinus was now opened revealing a well organized clot extending upwards to within an inch of the torcular. No bleeding occurring from the jugular end on opening the sinus as low down as possible the usual jugular exposure was made showing the clot extending 1 inch into the neck below the bulb so the vein was resected from this point to the clavicle. Wound packed with gauze. The

temperature never again rose above 100.5° and the recovery was rapid and uneventful.

Case III.—Va. B., age 6 years. Referred to me by Dr. Chas. T. Parrish of Portsmouth, Va., with history of earache, some discharge and temperature of 103 at times, taken irregularly for three days previously. Examination showed slight discharge in the canal and a small perforation in the anterior inferior quadrant in a bulging membrane. Mastoid exquisitely tender. She was immediately sent to hospital, and the membrana tympani was thoroughly incised under nitrous oxide. The temperature reached 103 six hours later, and, as there was a profuse discharge and the tenderness had not lessened, I operated at 2 p. m. the next day and found only a moderate disease of the mastoid bone, but the antrum and tip cell were filled with seropurulent fluid. The sinus groove was somewhat softened, and the sinus was exposed over a small area, but no granulation or discoloration was perceived. Seven hours later the temperature reached 103, but fell suddenly to 98. During the next 36 hours the temperature was irregular, ranging from normal to 102, and at the end of the above mentioned period went to 103. I now did a very unwise thing, viz., aspirated the sinus, and, as I got fluid blood, was misled as to its con-



CASE III.

dition, which caused me to delay the resection of the jugular for three days longer than I otherwise would have done. In view of the subsequent findings this was originally a case of primary bulb thrombosis which had not extended up to the point where the needle entered the sinus one-half inch below the knee. Twelve hours after the aspiration the temperature reached 104.2, and, had I not been misled by the result of the aspiration, I would now have opened the sinus instead of waiting for three days while the temperature played between 100 and 103, to finally again reach 104. I then opened the sinus and resected the jugular. I first made a thorough exposure of the sinus from the knee almost to the bulb. I then slit it thoroughly with a knife, beginning below and going upward to the knee. The sinus was found filled with a soft clot not adherent to its wall, and when the knife reached the knee the blood pressure gradually forced out a clot fully two inches in length and rat-tailed in shape, which must have reached almost to the torcular. I did not attempt to get bleeding from below, but immediately exposed the vein and found it firmly clotted for an inch after its exit from the foramen. I tied it off below just above the clavicle, and, after having tied off its facial and lingual branches, cut it off just below the bulb. The wound was then closed. The temperature was normal six hours after the operation, and the patient made an uneventful recovery except for infection of the neck wound.

Case IV.—P. D. G., aged 21-months, was referred to me by Dr. Lomax Gwathmey, of Norfolk, on November 2, 1904, who had seen the patient for the first time 24 hours previously. The mother stated that the child had had earache two weeks previously, lasting for several hours, followed the next day by a discharge from both ears which had continued. She had taken the temperature every day and especially when the child seemed to have fever, and on some days the temperature was as high as 103, while on others and for several succeeding days it was normal.

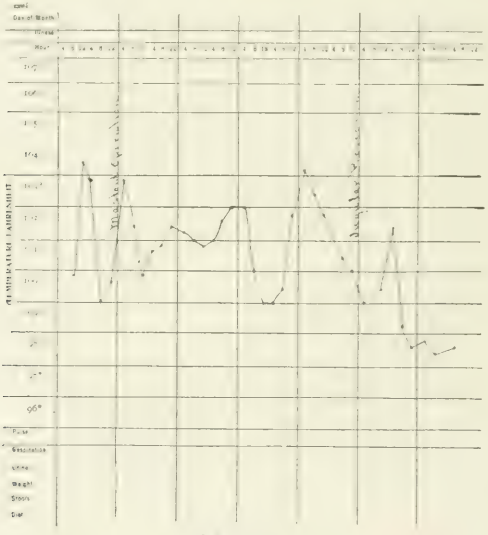
This case was complicated by bronchitis and a follicular tonsillitis, either of which, but especially the latter, might have caused the temperature. The next day the temperature fell to normal, and did not rise again for almost 24 hours, when it again reached 103. At this time an enlargement of the cervical glands developed on both sides just

CASE IV.

behind the angle of the jaw, but more marked on the left. I now advised operation, and, after some delay, consent was given. I operated on the left mastoid solely on account of the greater involvement of the cervical glands on that side, as from otoscopic examination both sides appeared to be equally involved. There was only moderate mastoid involvement, and, as the bony groove was neither discolored nor softened, I did not expose the sinus, but felt so sure of sinus involvement, and, realizing the importance of not opening the uninvolved sinus first, I exposed the vein, and, while I was of the opinion that the flow of blood from above was not in normal amount, consultants thought otherwise; so the vein was left alone and the wound closed. In 24 hours succeeding the mastoid operation the temperature went to 103.8, then to 102.2, then to 104.2, when it again receded to 102 to go in the next 12 hours, viz., 48 hours after the operation on the mastoid to 104. It gradually receded to 100.5, and remained practically at this for the succeeding 6 days. On the afternoon of the sixth day, however, it went to 105.5. I operated the next day, first exploring the mastoid of the right side, since the right ear was still discharging, but found pus confined to the antrum. The left sinus was then exposed for about 1½ inches and incised from below upward. It was found occluded by a well-organized clot, extending for ½ inch beyond the knee in its torcular end. The clot was removed and a free flow of blood established from above. There was no bleeding from below, although the bone was removed and the sinus slit almost to the bulb. I now reopened the neck wound, extended to the clavicle, and found the vein occluded for 1½ inches below its exit from the jugular foramen. The vein was then tied off just above the clavicle and resected up to the entrance of the facial and upper end brought out at the upper angle of the wound and the wound packed without an attempt to close it. Twenty-four hours after the jugular resection the temperature reached 103.8 and the next day 104.8, when an erysipelas of the mastoid wound, auricle and cheek developed, to subside in the next three days, but the temperature ran irregularly for ten days longer, frequently reaching 103, and on that day 103.8, after which it suddenly returned to normal, and there remained.

Case V.—A. S., col., aged 15 years. Walked into my clinic

at St. Vincent's Hospital, October 10, 1905, with the following history: Had had a running ear since childhood, which never gave any special trouble until three weeks ago, when she began to have severe pain in the ear and side of head, which had continued with remissions of a few hours to several days, until she presented herself for treatment. Otoscopic examination showed canal filled with foul-smelling, thick, yellow pus, which when wiped away showed absence of membrana tympani and ossicles and cholesteatomatous material at bottom of canal. Swelling under sterno-mastoid indicative of Bezold's mastoiditis, T. 100.9 F. Was admitted to hospital at 3:30 p. m., and the temperature reached 104.4 at 8 p. m. Operation, 8 a. m. Usual mastoid incision. The cortex seemed normal, but when the periosteum was retracted forward it was found that the anterior wall of the mastoid and posterior bony canal were absorbed. The cortex was then cut away, and the whole cavity of the mastoid



CASE V.

was found to be filled with a cholesteatomatous mass from the tip to the inner table of the middle fossa and backward beyond the sinus. Neither the inner table of the middle fossa nor the bony sinus wall was eroded through, and both were hard and white. An opening was made into the neck by removing the tip and about 4 drams of pus es-

caped from under the sterno-mastoid. The temperature reached 103.5 three hours after the operation, and then gradually declined to 100.8, and did not reach 103 until the next day, viz., 24 hours after the operation. It again gradually receded during the next 12 hours to 100, and again gradually rose during the next 20 hours to 104.2. I operated the next morning by first exposing and tying off the vein. I found the vein very small to the common entrance of its facial and lingual branches having no blood coming from above and remaining empty when cut off from below. I then exposed the sinus and opened it freely, when I got a free flow from above and a parietal clot from below with the curette, but the thrombus was confined almost entirely to the bulb, so that it could not be removed. Having tied the vein below just above the clavicle, I brought the upper end out of the upper angle of the wound and packed the wound without suturing it. The temperature was 102.4 twelve hours after the jugular resection, but went to normal three hours later and never again rose.

DISCUSSION.

Dr. McKernon: I think in all his cases, Dr. Kennon deserves great credit. There is one point I would like to emphasize, and that is the closing of the neck wound. I have seen a number of these cases, and I think we have all observed what Dr. Kennon says, that at some stage of the healing they break down. In the last eight cases that I have had, I have had only one neck wound that has broken down, and that only partially, and situated at the lower portion of the wound. The dressing which I have used has been to flush out the neck wound after the removal of the vein and diseased glands with a normal salt solution, and before putting in my sutures, I roll up a good-sized cigarette drain. The drain is as large as the middle finger, if not larger, and it is placed the entire length of the wound, and comes out at the lower angle just above the clavicle. After this has been placed in position, the wound is closed with a continuous suture of silk, and gauze soaked in a hot saline solution and covered with rubber tissue is placed over the wound, and this allowed to remain on for twenty-four hours, at the end of which time

it is again removed and the cigarette drain drawn out for about an inch and cut off. The dressing is removed in this way every twenty-four hours, a portion of the drain being withdrawn each day, so that at the end of the fifth or sixth day the drain has been completely removed, and you have primary union. Formerly, I used a drain composed of gauze of only two or three inches in length, and placed in the lower angle of the wound, but my results were not satisfactory, so it was discarded for the method just detailed. I would like to ask Dr. Kennon to try this method, and I believe he will in the future get a much better cosmetic result. Another point is relative to the temperature. I think this symptom is the one from which we all learn most about the more cases of sinus thrombosis we see. It usually depends on the amount of septic material entering the general circulation, and, if it be small in amount, the temperature is not very high. Always if there is a large quantity of septic material suddenly thrown into the general circulation, the temperature range is much higher. Dr. Kennon speaks also of the fact of the temperature not rising above 103 or 103.5. I do not think a case with this temperature is at all typical of sinus thrombosis, but more of the atypical type. Certainly several years ago we would have waited before operating until it showed more evidences of a typical thrombosis. In many of the cases coming under the head of the atypical type, there is a slow, gradual rise of temperature to 105 or even higher, and remaining so for a number of days without a characteristic drop, which is usually looked for in this disease. Especially is this the case where a mastoid has been operated upon, and for the first few days following the operation, things have progressed favorably. When after the fifth or sixth day, upon inspection of the wound, we find the bone cavity dry, and certain areas show no tendency to granulation, or if there be any granulations, they are soft and flabby, and covered by a grayish deposit. This physical sign is frequently present over a portion of the sigmoid groove. In other cases, the sigmoid groove is free of any granulation tissue, but in its place you get a darkened inner table, which later on will increase if you allow the case to progress for several days. I think there are certain definite symptoms present in a number of the cases which aid us in making a diagnosis, but in this particular type of case if we wait for a sudden rise of

temperature after it has been running continuously high for several days we are lessening the chances of recovery. The Doctor also speaks of the little importance attached to the chill. I fully agree with him there, for in a number of cases that I have seen there has been practically no chill noticeable, neither has there been even a chilly sensation. I think, however, when the chilly sensation is present it is just as indicative as though a distinct and decisive chill had taken place. I want again to thank Dr. Kennon for his paper.

Dr. Reik: I, too, wish to express appreciation of this excellent paper; indeed, I feel that if I had derived no other benefit from my visit to Norfolk, the hearing of this paper would amply repay me for the trip. Dr. Kennon is to be congratulated upon his success in these cases, a percentage of recoveries which is decidedly above the average.

I agree with both the previous speakers in their opinion regarding temperature and chills in sinus thrombosis. It seems to me, however, that it is time we ceased to look for any one distinctive symptom upon which to base the diagnosis of thrombosis. A preoperative diagnosis depends upon the recognition of signs of septicemia and to be of value, this recognition must take place soon after septic absorption begins. If we wait for a succession of chills and sweats or a cord-like swelling in the neck, an operation will often be delayed beyond the point of helpfulness.

I am glad Dr. Kennon alluded to Whiting's method of stripping the sinus for diagnostic purposes, and I hope the speakers who follow will relate their experiences with this symptom. I admire Dr. Whiting's work very much, but have hesitated to adopt this process to determine the patency of the vessel. It seems to me a risky thing to do. I am not always able to say, from inspection of the vessel wall, what the condition of its contents may be, and I fear the breaking of a thrombus and the washing on into the general circulation of infective particles by this process of stripping.

Dr. Kennon spoke of our having too great a respect for the sinus. Perhaps it would be better to say that we should not have too much fear of the sinus. We should have the greatest respect for a vessel of that size and character, but should not fear to attack it when diseased. No man who fears the horse ever becomes a good rider or driver, yet every capable horseman feels a proper respect for the possible antics of a

vigorous horse. If the sinus is infected, we should operate upon it, and operate courageously. I understood the essayist to recommend ligating the internal jugular vein, prior to opening the sinus, only when a clot was believed to be in the neighborhood of the bulbous portion. I have recently been reviewing the literature with the idea of trying to determine whether it is possible to distinguish cases in which the sinus might safely be opened and the jugular left alone. That work is not concluded, but, at present, I am of the opinion that whenever we have made the diagnosis of probable sinus thrombosis it is wiser, always, to ligate the jugular before opening the sinus. If a thrombus exists, the chances are that it is an infected one; if you break up that clot, directly or indirectly, a particle may be washed on into the general circulation, and the route to the heart is a short and direct one; if the sinus is obstructed, no material change is produced by ligating the jugular, which is only an extension of the same vessels, and it can make little difference to the patient whether his jugular sinus is obliterated a little below or a little above the angle of the jaw; and jugular ligation adds little if anything to the serious nature of the operation.

Dr. Kennon: I have not tried the wet dressing on the neck wound, as described by Dr. McKernon. Three of the cases here reported had infected neck wounds, and they were the ones that were closed at once. I went so far as to put in deep cat gut sutures, which I knew to be clean, thus pulling the wound together so that no secretions would collect in the wound, and I also put in a drain, possibly not so long as Dr. McKernon suggests, but I had to open them later with considerable pain to the patient, and it took a considerably longer time for the operation, a very important point, and for the final healing of the wound, and there was a larger scar. The results I have obtained in drawing these wounds together with adhesive strips have been good even after they have been infected.

As to the temperature, Dr. McKernon misunderstood me there. It is very nice to get typical temperature. What I want especially to draw your attention to, is the fact that it is not even usually typical. It may be thought to be malaria or typhoid. If you don't suspect sinus involvement, the general physician will diagnose malaria or typhoid, and when it is so diagnosed you have generally got to sit down hard and

say you believe it is sinus involvement. I had to do so in two cases, and finally came out all right. In the third case which I saw, the thrombus had not extended to the sinus when I first saw the patient.

It was left for three or four days, during which time the sinus became infected. In many cases there will be no granulations on a sinus wall which contains a clot as mentioned by Dr. McKernon, but in Case 3 I had to scrape granulations off the sinus wall in order to examine it, and it was found to be firmly clotted.

In regard to Dr. Reik's remarks on the advisability of tying off the vein before opening the sinus, as time goes on I am more and more in favor of this procedure, but we will certainly open a good many uninvolved sinuses, but it is better to tie off some good veins than to let infective clots into the lungs. Anyone who has had a case of septic pneumonia will do almost anything to avoid seeing a second case.

In regard to the feel of the sinus, I hate to differ with such an eminent authority as Dr. Whiting, but in most cases I must admit that I cannot tell the difference between clot and the brain by the sensation imparted to the fingers by palpation. Some men who have larger experience and better judgment may be able to do so, but I cannot.

PAPER:

THE SUBMUCOUS RESECTION OF THE NASAL SEPTUM WITH BALLENGER'S SWIVEL KNIFE.

JAMES F. McCAW, M. D.

Since hearing the remarks and having the pleasure of seeing Ballenger demonstrate the use of his swivel knife in the submucous resection of the nasal septum, at the last annual meeting of this society in Boston, I have taken it up with much enthusiasm as an operation well fitted to the correction of septal deviations.

In this short paper I will give my personal experience gained from sixteen cases operated on by me since July, 1905, speak of some of the important points and difficulties encountered, which have been brought out by other writers, and call attention to some difficulties liable to be encountered, mention of which I have not seen in my review of the literature of the subject.

Of the sixteen cases operated on, 12, or 75 per cent, were males, 4, or 25 per cent, females. Thirteen were young adults, two were middle-aged and one 19 years of age. In seven cases the deviation was into the left naris, and in five into the right. Four cases presented deflections of the sigmoid variety; of these, three were vertical and one horizontal. None of my cases, could I say, were purely cartilaginous, one was entirely bony, while the remaining fifteen were osseocartilaginous. Of the two cases of bowed or C shaped deflections, one was extreme, completely occluding the nostril of the convexity; the antero-inferior border of the triangular cartilage was dislocated into the opposite nostril and the tip of the nose deviated toward the convexity.

One large perforation occurred. In two cases the entire mucoperichondrial flap of the convexity was lost at the time of resecting the triangular cartilage, details of which will be spoken of later. One severe postoperative hemorrhage oc-

curred. Regarding the etiology of deflections, my clinical experience leads me to indorse Freer's criticism of Killian's devision of septal deviations into those due to faulty growth and traumatism. In this connection Freer says: "It does not seem mechanically reasonable that force enough should be conveyed by the elastic cartilage of the septum to its bony skeleton to break either the perpendicular plate or the vomer. The fact, therefore, that a cartilaginous deflection is continued into the bone is to my mind an argument against its traumatic origin. I think, therefore, that while traumatic deviations occur, their frequency is over-estimated and that it is better to leave the supposed etiology of deflections out of the question in grouping and describing them."

The sitting posture for the patient has been used in all my operations, for the reason that the field of operation is more accessible, the operator is in a more comfortable position and can, therefore, manipulate his instruments to better advantage. Besides, the patient is not annoyed by secretions and blood dropping back into the postnasal space.

I believe with Killian in the necessity for a thorough preparation of the patient. The face and vestibule of each nostril should be washed with soap and warm water and finally sponged with a bichlorid of mercury solution, after first clipping the vibrissæ from the nostrils. A sterile sheet is then placed around the patient's neck and sterile towel about the head to protect the hair. All instruments and in fact everything coming in contact with the patient must be prepared according to rules laid down for clean surgical work. It is needless to add that the hands of the operator and his assistant must be surgically clean. For the above reasons and others which will be mentioned later, I think it preferable to do this work in the hospital, where the patient remains over night and can return home the following day. This to many may seem an unnecessary amount of preparation and precaution, but those of us who have to operate in our office, without an assistant, with the probability of interruption and the necessity of hurry, will readily realize the importance of it. Mosher, in the *Laryngoscope,* November, 1905, sums up the situation very clearly when he says: "It is essential, however, that you have a quiet patient, that the operator be fresh, and that he be free from the pressure of a large waiting clinic. When the element of hurry comes in it is common to perforate or lose

the flap on the convex side." My method of anesthetizing the mucous membrane differs somewhat from that used by most operators. I use a solution of cocain 1 per cent in adnephrin 1-5000 to first spray each nostril. This relieves the extreme sensitiveness of the membrane, after which I use pledgets of cotton saturated with cocain 8 per cent in adnephrin solution 1-5000 to thoroughly pack each nostril over the entire area of deflection. This I allow to remain fifteen minutes. As I begin to apply the anesthetic, the patient is given morph. sulph. gr. 1/8 by mouth. This method gives a profound local anesthesia without the necessity of a second application. Although I have operated upon several excessively neurotic patients, there has been an absence of cerebral excitement, fear, anxiety or syncope. This I attribute to the slow absorption of cocain due to my method of applying it in combination with adnephrin and to the sedative and antagonistic effect of morphin to the cerebral stimulation of cocain.

I am convinced that no one incision is capable of meeting the requirements of all cases, and I now vary my incision according to the requirements of the case in hand. In my first cases, Killian's incision was used exclusively. Now in the bowed deflections with dislocation of the antero-inferior border of the triangular cartilage into the nostril of the concavity, I follow Freer's advice and carry my incision along the free border of the cartilage, and another vertical incision over the convexity in the opposite naris. In crest-like deviations far back on the septum Freer's vertical incision in front of the deviation seems to be most desirable, giving a more accessible field of operation. For those deflections involving the greater part of the bony skeleton, his L incision can be highly recommended as being better fitted for this particular class of cases than any other we have tried.

The Killian incision has been used in the left nostril regardless of the convexity in all cases where the deflection involved the cartilage and only the most anterior part of the bony septum. In some cases, after beginning with the Killian incision and finding myself handicapped for room to reach the most posterior limits of the deflection, I have made another incision, starting sufficiently far back on the septum to give a perfectly exposed operative field and cutting forward along the floor of the nose, joining the Killian incision at its lowest point. This gives a posterior flap which can be tucked up

out of the way and the operation, completed under the eye of the operator, which is very essential to avoid perforations.

Too much stress cannot be laid upon the necessity for a thorough separation of the mucoperichondrium, slightly beyond the limits of deflection, otherwise there is the liability of perforation or the loss of the entire flap of one side during the resection with the swivel knife. This unfortunate accident occurred, as mentioned above, in two of my cases.

Ballenger has undoubtedly made a great advance in the element of time saving by the introduction of his swivel knife; but has, I think, placed the time limits for a complete operation, viz., five to twenty minutes, too low for the average operator, and I am thoroughly convinced that care, perfection of technic and thoroughness should not be sacrificed for time; for he who attempts to operate with great rapidity in small cavities like the nostrils, will surely come to grief in some of his cases. I believe, however, that we should work as rapidly as possible, consistent with care and thoroughness. After the thorough elevation of the mucoperichondrium from each side of the septum, a Killian's medium-sized speculum is introduced, one blade through the incision in the cartilage below the perichondrium, the other between the perichondrium and septum of the opposite side. By opening the blades of the speculum the flaps are ballooned. The swivel knife is now introduced astride the cartilage and forced into it along the floor of the nose for about ¼ inch, so that the blade is beyond the free border of the perichondrial flap when the speculum is removed and the resection completed quickly. It is just at this step in the operation that my most disastrous results occurred, viz., the loss of the flap from the convex side, and was due to an insufficient elevation of the mucoperichondrium over the convexity. The two cases in which this occurred were among my first five cases, and were very pronounced deviations in which I used the Killian incision and attempted to use only the Hajek straight elevators. While one can, through a Killian incision, elevate thoroughly over the concavity with these elevators it is, to the writer at least, almost impossible to get around the marked convexities with this large straight instrument through this anterior incision, and especially where the deflection is nearly or in contact with the lateral wall of the nostril. For this reason my elevation was incomplete in the cases referred to, and in making the re-

section with the swivel knife it perforated and caught up the flap at the point of attachment to the convexity and cut it along the line of the resected cartilage, so that in removing the piece of cartilage the mucous flap came with it. While this may seem an unusual complication and one easily avoided with ordinary care, the fact that it has occurred is sufficient proof that it is likely to occur again. As I have not seen any reference to this mishap in the literature reviewed, it seemed wise to call attention to it. In these cases I now use the L incision and Freer's slightly curved blunt elevator which is thin and will hug the convex surface of the cartilage very closely, and by working slowly and cautiously the mucoperichondrial elevation can be safely made without perforation.

In the removal of the bony deflection the writer follows the advice of Freer, and after assurance that the bone is completely freed of its periosteum on both sides, the deflection is followed back and bitten away with forceps until every vestige of the deviation is removed. It was in my attempt to follow back a very pronounced horizontal deviation in firm contact with the middle turbinate bone that my only perforation occurred. It being far back and high up on the septum, no scabbing or untoward result followed. The chisel and mallet have been used to remove the deviated portion of the crista incisiva after first thoroughly elevating its periosteum. This, except perhaps at the extreme anterior end, the writer has not found difficult.

A word concerning the packing of the nostrils. Most operators advise packing both nostrils lightly, but Freer only on the side of operation. The author has been following the former advice without the slightest trouble from bleeding until my last or sixteenth case, in which there occurred a very alarming hemorrhage about three hours after the operation, the patient losing an unusually large quantity of blood before the writer reached him. From this experience I have resolved to use a snug packing in each nostril for twenty-four hours, at the end of which time it can be removed from the unoperated nostril, the other remaining, if it seems wise, for twenty-four hours longer. There can be little harm to the patient in a firm, snug packing for this length of time, and it will certainly give to the operator a great sense of security from the probability of postoperative hemorrhage.

The after-treatment is simple, and is that merely of clean-

liness and protection until the wound surfaces heal.

One strong point in favor of and which recommends the submucous operation, aside from the fact that it more thoroughly corrects deviations than any other with which the writer is familiar, is the slight reaction and the complete absence of discomfort afterwards.

The immediate result in all my cases has been ideal, but as to the permanency, I cannot yet speak, for the time elapsing since the operation on my first case is only about six months. In the two cases in which the flaps were lost, there has been some annoyance from dryness and slight scabbing, but this is now improving.

Freer, in speaking of the possibility of damage to the nasal profile, says: "Some operators hesitate to adopt the window resection, urging that though it does not itself cause the bridge of the nose to sink in, its support is nevertheless weakened, so that a blow on the nose would readily flatten it." Four cases are cited to show that, although complete resections were done in each and each received severe blows on the nose; seven days, twelve days, two and a half years, and three weeks respectively after the operation, no deformity or damage to the profile resulted. One of my cases in which a complete resection had been done was playing with his baby when he received a blow on the nose from the baby's head four days after the operation. Two weeks later while working around his pleasure boat he raised his head quickly from a stooping position and received a second severe blow on the nose from a cross-bar. Aside from some bleeding and slight swelling no injury to the nasal profile occurred. From the above experience it would seem the danger from that source, although possible, must be overestimated.

Although Krieg and his followers sacrifice the flap of the convexity, the two cases of mine in which this happened I consider partial failures. These failures have taught me more about the submucous resection of the nasal septum than fifty successful cases without a failure could possibly have done.

From the limited experience which I have had, my conclusions are:

(1) The operation can best be performed in a hospital, where attention to the details of preparation can be thoroughly carried out, where trained assistance is at hand, and the patient can be kept quiet for the first twenty-four hours.

(2) All effort must be made to have a quiet patient. Thoroughness must not be sacrificed for the element of time.

(3) Strong solutions of cocain have not been found necessary, as profound anesthesia can be produced by my method, and with the addition of the morphin the operation can be completed without a second application and without the fear of having to stop the operation on account of the extreme excitement or syncope which sometimes occurs where stronger solutions of cocain are used.

(4) No one incision is applicable to all cases and it must be varied according to the indications of the case in hand; the idea being to give the greatest possible freedom to the field of operation.

(5) The lighter and more delicate elevators of Freer are applicable in the greatest number of cases, but in suitable cases the elevation can be made more rapidly with the Hajek instrument.

(6) Ballenger's swivel knife is the most satisfactory instrument for resection of the septal cartilage; doing it quickly, neatly and with the preservation of the specimen. It is certainly an advance in this particular step of the operation.

(7) Alarming hemorrhage, though infrequent, may occur, therefore a snug packing in each nostril for the first twenty-four hours seems advisable.

(8) From the patient's standpoint, the minimum amount of reaction and complete absence of discomfort is a favorable commendation and justly deserves our consideration.

(9) The results are ideal, and the operation in the writer's opinion is destined to supplant all others in dealing with septal deflections in their manifold varieties.

DISCUSSION.

Dr. Davis: I would like to know if you have used the soft metal Kyle splints. In quite a number of these operations we have used them with most excellent results, and never have had any sloughing, and it seems to me to be a most excellent way to hold all the parts together. I may mention an interesting case we had recently, the result of an accident; the patient had been struck on the nose, causing obstruction to both nostrils from the split septum, and when we cut through the membrane on one side we found after removing the ob-

structing cartilage that there was a large piece in the centre in a perfectly straight position, so after making an incision on the other side and removing the deflected cartilage on that side, there was left a perfectly straight cartilaginous septum remaining.

Dr. MacCuen Smith: I would like to ask Dr. McCaw if he has ever used Ballenger's method of applying the cocain powder to the septum first.

Dr. Kent: I think the discussion of this paper alone would amply repay us for a trip to Norfolk. I should like to ask the doctors that have had more experience than I have had along this line, what is the best method of getting rid of the attachment where a spur on the septum has grown over and become attached to one of the turbinals? I should like to know also how much of the cartilaginous portion of the septum they usually remove? For instance, if the front part of the septum or cartilaginous part is perfectly normal, and behind that you find a prominent bulging of the bony part, would you disturb the cartilaginous part? In general surgery, I believe there is always a repair of the bony tissue where the periosteum is left. Do these cartilaginous and bony parts reform after septum operation? Most of the doctors who have spoken seem to be afraid of strong solutions of cocain. I have had my worst poisonings with four or five per cent solutions of cocain. I think one reason was, that I was not so careful in the distribution of the cocain over the surface as I would be with a strong solution. In most of the work I do about the nose I dip the cotton into a 20 per cent solution and only apply it just around and over the surface that I am going to operate on, and never allow any of it to drop into the throat if possible. I believe I have gotten less poisoning from the strong solution than I have from the weak ones, for the reason that when you cocainize with a strong solution you apparently don't have so much absorption by the mucous membrane as with the weaker solution, the contraction being so much more rapid, thus stopping absorption.

Dr. McCaw: In regard to Dr. Coakley's criticism on sterilization, as I said in the paper it may seem unnecessary, but there is always the possibility of infection. The fact that the doctor alluded to the physician putting his hand on the side of the patient's head in contact with the hair, is evidence to show that we should take means to prevent it. I distinctly

said that I did wash out the nostrils and clip the hairs from the vestibule. I use a sterilized towel that comes down around the patient's head, protecting the hair, the operator can then adjust the head without coming in contact with unsterilized parts. The doctor spoke of my method of using cocain with a spray. I spray first with 1 per cent solution, and have them blow it out quickly simply to relieve the patient of the pain of packing the nostrils. Morphin I am convinced has some effect in overcoming the cerebral stimulating effect of the cocain. I have operated with and without it, and have a case in mind in which I did not use the morphin, and, although the patient was a healthy young man, he was overcome by syncope. The doctor speaks of using the anterior incision in all cases. I think that is a matter of personal experience. I think each operator by his experience settles for himself the incision he can use to best advantage and can do better work with. Personally, I have not been able to do as thorough work on the posterior part of the septum with the anterior incision as by the vertical incision of Freer, and I therefore use the incision which I think will best meet the conditions present. I agree fully with Dr. Coakly about packing. I think the packing is really of great importance for its influence on the ultimate result. If you don't pack smoothly and firmly you get a bulging and thickening of the membrane. Special care should be taken in packing high up, as I believe from this region we are more likely to get hemorrhages. The results that I have obtained have been ideal, except in the case mentioned, which I consider a partial failure, where I lost the flap, the cause of which I believe to have been an insufficient perichondrial elevation before I introduced my swivel knife. In the removal of deflections of the bony septum, my method has been so far to simply elevate the periosteum as far as I can above and below the deviation and bite it away.

Dr. Kent: The point was what do you do with the attachment, suppose it has grown to the turbinal?

Dr. McCaw: I have not had such a case yet. I think, however, it could be dealt with in the same way as any other bony deflection. In regard to the effect of adnephrin, I think it has a decided effect. It gives a clean and free field of operation. I have had no experience with the splints of which Dr. Davis spoke. The swivel knife in my hands, at least, is

the best instrument for resecting the cartilage, and I consider it of decided value in this step of the operation. The stitching of the wound I consider unnecessary, the packing holds the parts in place.

PAPER:

CLEFT PALATE.

JOSEPH A. WHITE, M. D.

Cleft palate is a subject that should be of equal interest to the surgeon and to the dentist, but from my experience most surgeons are very glad to throw the responsibility for correcting the deformity upon the dentist, and the latter has devised quite ingenious artificial contrivances for filling up the cleft and making an artificial movable palate.

But all things considered, I should, myself, prefer the successful result of the surgeon's skill to any kind of artificial apparatus that would have to be taken out and replaced. It is true the operation takes a long time, as it is very tedious work, and sometimes with the greatest care the work is only partially successful, and has to be done over. I have, however, been so successful in all the operations that I have done, I consider that the results repay careful attention to details in operating. Of course, cleft palates do not come for operation very often. I have operated on only twelve or thirteen cases in all, and all but one were females.

When not associated with hare-lip, there is no external deformity and, therefore, a great many children, victims of this congenital trouble, are allowed to go for many years without any attempt at correcting it. Where hare-lip accompanies it, the parents are very anxious to have the defect remedied at once; otherwise, they seem to be careless about the matter, notwithstanding the grave defect in the articulation, that always is present in these cases. There are certain letters and certain words that persons with cleft palate cannot possibly pronounce, but the time permitted in this paper does not allow this part of the subject to be gone into thoroughly. All of you, however, are sufficiently familiar with this effect of cleft palate.

The sooner such cases are operated on the better, because the child can be so more readily taught to overcome the defective articulation. I have never operated upon a child under

4 years of age, and only one that young, but I think it would be best to operate at about 2 years of age, if the child is strong and healthy. Even in the older cases much may be accomplished to remedy the defective articulation, by proper vocal exercises. I have a case in Richmond now that I operated on some years ago, when the child was 7 or 8 years of age. Her articulation was very bad, and many words were absolutely unintelligible. Under patient tuition, her articulation today is so good that there is hardly any appreciable defect. She speaks as clearly and distinctly as most people, and better than some who never had a cleft palate. This shows what may be accomplished by proper teaching and proper voice culture.

Apart from this favorable result of the operation, the closing of the cleft is of importance in doing away with the catarrhal conditions in the nasal spaces that nearly always accompany this defect, due probably to the exposure of these parts on the one hand, and to the irritation of food on the other.

But there is one point that I wish to call attention to in regard to cleft palate, and that is that it has so little effect upon the hearing. It seems strange to me that the latter is not oftener impaired. The imperfect action of the tubal muscles, the tensor palati, the levator palati and palatopharyngeus, should theoretically result in more or less impairment of the calibre of the Eustachian tube. Strange to say, however, I have very rarely found deafness accompanying the defect. Even in the case 36 years of age, the hearing was practically perfect.

I have operated upon three cases of cleft palate in the last two years. In one case the young lady was 12 years old, in another case 15 and in another case 36. In all three of these cases the cleft was through both the hard and soft palate. In one case it extended only half way through the hard palate, in another it extended up to the alveolar process and in the adult case through the alveolar process, with a large cleft in the lip, or hare-lip, as it is known. The accompanying sketches will give some idea of these cases. I have tried various ways of approximating the edges of the cleft, and have settled upon a fixed method of operating, that, if followed closely, will result in practically a perfect success.

Most of the books will suggest freshening the edges of the cleft by cutting off one-sixteenth or one-eighth of an inch

so as to make the surface perfectly raw. I think this is a mistake, because we cannot afford any possible loss of tissue, as we need every bit of it in bringing the edges together. Instead of paring the edges of the cleft, therefore, I split the mucous membrane, covering the edge of the cleft, from the commissure or point of junction to the ends of the split uvula. I then strip this back on the anterior and posterior surfaces of the cleft with a thin elevator, and when stripped back, it retracts, leaving a clean raw surface along the whole edge. This takes time and patience, for it is a tedious job.

When this is accomplished, I split the mucoperiosteum covering the hard palate, close up to the alveolar process. I begin my incision at such point between the central incisors and the posterior molar, as may suit the size of the cleft, and the knife must keep near the alveolar border, particularly when it reaches the molar teeth, where the incision must hug the alveolus closely in order to avoid cutting the posterior palatine artery, which comes out of the posterior palatine canal just back of the posterior molar and runs in the palatine groove forward, very close to the periosteum. If this artery is cut, it not only causes a great deal of hemorrhage, but it interferes with the nutrition of the mucoperiosteal flap. A thin curved periosteal elevator is then pushed under the periosteum and the flap is stripped to the edge of the cleft, where it is separated from the bony edge. As I have just stated, the length of the mucoperiosteal flap will depend upon the size of the cleft. Where the cleft extends all the way forward to the teeth, without involving the alveolus, the incision can be carried on both sides so far forward as to leave only about one-half an inch just behind the commissure of the cleft to keep the flaps in position. This incision through the mucoperiosteum can be continued back to the projection of the hamular process, and there the bistoury can be carried entirely through the soft palate after it passes off of the bone and a slanting incision made from the process upwards, forward and inwards, so as to cut through the tensor palati tendon which runs off directly at right angles from the hamular process to the median line of the palate, and to also partially cut through the broad tendon of the levatorpalati.

When this is done, the mucoperiosteal flaps and the split portions of the soft palate ought to come together without any trouble. If they do not, the incision of the fibres of the levator

palati should be extended sufficiently to divide more of its fibres. The success or failure of the operation depends entirely upon the absolute relaxation of these two muscles especially, although both the palatopharyngeus, which is the muscular part of the posterior pillar and the palatoglossus, the muscular part of the anterior pillar, may have to be divided also, but that can be very frequently done after the parts have been brought together. Sometimes it is even necessary to partly separate the palatine aponeurosis from its attachment to the margin of the hard palate to get free relaxation.

After the parts are thoroughly relaxed, all bleeding should be stopped before any stitches are put in, and I had a case recently where I had to wait for two hours before the parts were sufficiently free from oozing blood so that I could put in the stitches. The stitches must be put in with the greatest care, and I find that silk worm gut is the best for this purpose. In some cases putting in the stitches is not a very difficult thing with a properly curved needle and a satisfactory needle holder, but it is very much better to have needles made especially for this purpose. I have used with very great satisfaction, the needle designed by Dr. Luc, for sewing up the mucoperiosteum over the alveolus after a radical operation on the antrum. I have also found Killian's needle for sewing up the mucous membrane over the septum, a valuable adjunct. If from any cause such as swallowing, vomiting or coughing, an opening appears in the healing process, it is readily repaired and restitched by the use of these needles, but before I got hold of them I had the greatest difficulty in doing anything with these small openings, because the stitches were so hard to insert.

After the parts are perfectly adjusted by the stitches, the posterior and anterior pillar on both sides may have to be thoroughly cut across so as to relax the fibres of the palatoglossus and the palatopharyngeus, if there is much tension.

The after-treatment consists in keeping the mouth as sterile as possible by a wash of any of the antiseptic preparations (I generally use borolyptol), and for the first forty-eight hours or more allow no food to be taken by the mouth; in fact, if they are well-nourished individuals, I do not give them anything for forty-eight hours. After that, if I have to still de-

prive them of food from the mouth, I use rectal alimentation. No solid food is allowed by the mouth for ten days.

In regard to anesthetics, I find that the operation is very much better done under cocain, and, except in very young children, I do the work entirely under cocain. The vivifying of the edge of the cleft by splitting the mucous membrane is done without the slightest discomfort, by merely painting the parts with a solution of cocain. For cutting through the mucoperiosteum and stripping it from the bone, I inject cocain along the line of the incision and paint the whole surface with a saturated solution of cocain, but in spite of this it gives some little pain.

This method of operating applies to all clefts, unless it extends entirely through the alveolar proces in front and involves the lip, as in one of the cases herein mentioned. In such cases the operation has to be divided into two or three sittings. It would be impossible to strip up all the mucoperiosteum and slide it to the center, because there would be no anterior attachment and nothing to hold the flaps in place, to say nothing of the possible lack of nutrition. Consequently, I strip the posterior part of the mucoperiosteum only and bring it together with the soft palate, leaving the triangular opening in front with the base towards the lip. When the soft palate and the part of the mucoperiosteum already lifted unite, I strip up the anterior part of the mucoperiosteum on each side and bring it to the center, which gives a perfect roof to the mouth, leaving only the gap in the alveolus, which can be filled up by the dentist, with artificial teeth.

The lip, of course, when involved in such cases, is adjusted by one of the usual methods for cases of hare-lip. In the cases presented here, you can see the method I have adopted and the result. I think this is the best way, as it does not leave the usual indentation in the lip, usually present after hare-lip operations.

DISCUSSION.

Dr. J. F. McKernon: I have done some work on cleft palates and my method has been almost the same as that described by Dr. White, with the exception of splitting the mucous membrane. I tried this method in two cases, turning the membrane back and bringing the edges together, but I do not get as good results as in the cases where I pared the

edges of the cleft from uvula to the apex. I usually pass my sutures in the soft palate from the uvula forward as far as the junction of the hard and soft palate before the alveolar incision is made, as I find they can be introduced more easily before than after the mucoperiosteal flap has been separated from the bone. In introducing the sutures, I use a curved needle which I had made several years ago. It consists of a right and left. Sometimes the sutures can be more readily passed from the left than the right, and vice versa. The suture material in all my cases after first four, has been silver wire. One point in the after-treatment is that I allow nothing to be introduced into the patient's mouth, either in the way of nourishment or as a drink, for from five to six days, but nourish entirely through the rectum, by means of enemas of peptonized milk given every four hours, and usually once or twice a day in place of the nutritive enema, give a pint to a pint and a half of a normal salt solution. At the end of the sixth day I usually remove the stitches, and then I have the patient swallow first some sterile water, and this is followed by a small quantity of sterilized milk, and this again followed by sterile water. I have operated on a number of these cases during the last four or five years under cocain anesthesia, and I like it much better. Formerly, I advocated doing a preliminary tracheotomy prior to operating, and after the palate had been repaired, packing the mouth full of gauze against the new palate. Since Yunker's method of giving chloroform anesthesia has been in vogue, I have used that instead of doing a tracheotomy, and giving the chloroform through the tracheotomy tube. I find one can operate as easily when the anesthetic is given by this method, as when formerly a tracheotomy was done. I did not stop the use of the preliminary tracheotomy because of any unfavorable results. I operated on eighteen cases, using the tracheotomy in all, with uniformly favorable results. Dr. White speaks of the age. The youngest child I operated upon was 4 years old, in which the Yunker method was used. I have operated upon thirty-two cases, and gotten nineteen primary unions, three absolute failures, and the rest were only partial successes.

Dr. J. F. McCaw: I wish to congratulate Dr. White upon the success he has had in dealing with this class of cases. My experience is limited to three cases, in none of which have the results been very satisfactory, especially in the closure of the

cleft in the soft palate. My last case was a baby, three months of age in which I attempted the Brophy method of closure; that is, of passing strong silver wire through the superior maxillae anteriorly and posteriorly, crowding the maxillae together thus closing the cleft, after first freshening the edges and holding them in this position by twisting the wires over lead plates placed along the alveola borders on each side. This gave a most excellent result on the hard palate but the soft palate broke down. The result with the hare lip in the above cases has been good which I think is the usual result obtained by most operators. I must say I approach the operation on cleft palate with misgivings.

Dr. J. A. White: The reason I said we should probably wait until they were two years old at least, is because an operation can be done at or even over that age more satisfactorily than under it, because it is so difficult to operate on the mouth of a little baby and manipulate the instruments satisfactorily. For this reason alone, I think it would be advisable to wait, and if it were not for the fact that they begin to talk about two years of age or a little under, and that the union of the cleft is important for proper articulation, I think it would be better to wait until they were still older. I have never operated on but one case under four years of age, and, therefore, I am not as competent to express opinion as those who have operated upon more cases as young as or younger than this.

MEETING OF WESTERN SECTION

Held at Los Angeles, January 27, 1906.

PAPER:

NASAL OBSTRUCTION A CAUSE OF DEAFNESS.

D. H. Trowbridge, M. D.

I have, for several years, been endeavoring to settle in my own mind, the real importance of nasal obstruction as a causative factor of middle ear catarrh, and after observing a great many cases of this character, I am fully convinced that the obstruction of the nares is responsible for a great deal more disease of the middle ear than it has been given credit for in the past.

In looking over several text books on the disease of the ear, I was unable, in some, to find any reference to the nares and their relation to the ears, and in others, very little space was devoted to the subject. In all, however, there was a liberal space allowance given to the pharyngeal vault and the influence of its disease and growths on the hearing; so that one would suppose that the anterior and middle nasal region had but little to do in influencing the proper functioning of the ears.

I think that you will all agree with me that in examining cases of deafness in general, we find in a very great percentage of them, a decided change in the nose from the normal. In a few cases of deafness we find an atrophic rhinitis, and in such cases we are apt to have an atrophic change in the middle ear as well. But in by far the majority of the cases of middle ear catarrh that have come under my observation, it has been my experience to find obstructive changes in the nostrils.

We are all perfectly familiar with the decided effect which adenoid vegetations in the pharyngeal vault have upon the hearing, especially in children and in young people. We are every day finding cases of this kind where the patient is almost entirely deaf, and after removing the adenoid growth thoroughly, we find in a few days that our patient has perfect hearing. Now, if the enlarged third tonsil can be the agency in produc-

ing such a decided influence on the middle ear, it seems only reasonable to suppose that an enlarged and tumified middle or lower turbinate, which is just as near the orifice of the Eustachian tube, and is of the same continuous mucous membrane, should produce just as decided an effect.

Again, we are all accustomed to have a patient suffering from an acute cold, with inflammation of the membranes lining the nasal cavities, come to us with decided reduction of hearing, which is entirely relieved as soon as the acute cold and congestion in the nose is cured.

Reasoning from the above, it seems to me that the only natural conclusion to draw is, that where we find a patient who is suffering from chronically obstructed nostrils, either by enlarged turbinates or deformed septum, he is in danger of a chronic effect on the middle ear, just as an acute obstruction will produce temporary deafness. I make it a rule to examine the nostrils, as well as the pharyngeal vault, in every case of deafness that comes to me. And during the past several years, I have commenced the treatment of a number of these cases of deafness by operating on the nostrils to obtain a thorough ventilation of the nostrils. Of course this was after ascertaining that there was no obstruction in the vault of the pharynx. If there was a septal spur, I removed it. If the obstruction was due to hypertrophied turbinates, either middle or lower, I did a turbinectomy and this on one or both sides, as the anatomy of the nostrils demanded, to procure a good, free and open nostril on both sides.

In many of these cases I have been gratified to find decided improvement in the hearing after from two to four weeks. In cases where the deafness had not been of too long standing, or too severe a degree, the hearing became normal; in others it improved to some extent, and in still others of a more deeply seated character, I obtained little or no improvement in the hearing. Many of these cases that had been brought to find relief, came on account of the tinnitus, which is often the first symptom of which the patient complains, even before he realizes that he is becoming deaf at all. In some of these cases the tinnitus had entirely disappeared, and in a considerable number it was relieved to a large extent. In addition, in nearly all cases, the patient feels the relief obtained by being made to have free nasal respiration.

The results mentioned above were obtained in these cases

without any other treatment. Of course, I do not believe every case of deafness will be cured, or even helped, by the above method of treatment. Only in cases where the changes in the middle ear are not too far advanced, can we expect to obtain any benefit in the hearing. However, by the relief of the nasal obstruction, we can do much toward staying the progress of the disease, even if it is not very decidedly helped, and this is of no mean value to a patient who is becoming slowly but surely deaf.

It is a fact that is not entirely clear to me, that the deafness caused by an enlarged third tonsil is quickly cured by removing the cause, while middle ear changes, caused by other nasal obstructions of more permanent character, are more persistent and constant and much more likely to remain permanent. However, I have had such good results in many cases following the thorough removal of nasal obstructive process that I can not but feel certain that it is a very decided factor in the causation of deafness. Therefore, it seems to me it is most necessary as a prophylactic measure if for nothing else, that we make it a rule to point out to our patients the need of obtaining and maintaining free nasal respiration as a preventative of possible future deafness, even where it has not already caused middle ear changes.

A few words on my own method of operating on these cases may not be amiss. I have, in recent years, almost entirely discarded the electro cautery on account of its limited power to remove tissue, and also on account of the severe reaction which follows its use. In past years when I frequently made use of the cautery, I was many times chagrined to find in a few days that my patient had a suppurating ear, which I felt was entirely due to the reaction of the cautery. Since discarding it, I have never had that unpleasant result, except once, and that in a case where excessive hemorrhage required a secondary plugging of the nose for several days. Then again, the cautery will not remove any of the bony formation. Hence, if a bony spur or an enlarged turbinate is to be removed, it certainly is inadequate. My preference is for the trephine drill, operated by a motor which does not revolve too rapidly. With this I drill out nearly all of the bone, which I desire to remove, and the remaining soft tissue can easily be snipped off with a Pynchon's or Hartman's fenestrated nasal forceps.

My aim in these cases is to produce a large, free, open nos-

tril, and if we stop short of this we are apt not to obtain results. My experience has been that if I err, it is in not removing enough structure and that when the nostril is healed, that I have a nostril that is smaller than I wanted, rather than too large. I never remember finding after operating that I had a nostril that was too roomy, but on the contrary many times where I thought I had removed enough tissue, when the membrane was entirely healed, I found I had removed too little. I think there should be from one-eighth to one-fourth-inch space between the outer wall and the septum.

I do not for a moment think that old chronic cases of middle ear catarrh can be cured, or very much relieved, by the above method. Where once the condition is long established, it is one of the most baffling of the diseases we are called upon to treat. To cure, or materially improve middle ear catarrh, it is necessary to begin our treatment before the changes in the middle ear are advanced beyond the first stage. I think in cases of nasal obstruction in which the middle ear disease has not been of too long standing that we can expect much from a thorough removal of the obstruction.

Do not understand me as advocating this treatment as being sufficient in itself. Of course I make use of the ordinary methods of treatment and only advocate this as preparatory, as it were, on certain select cases which apply to us for relief.

With your permission I will report just a few cases:

Case 1.—Mr. B. consulted me on account of deafness of left ear. Test: Hearing watch R.—72/72 L.—24/72. He also complained of some tinnitus, and as he was a cornet player he complained of a peculiar, unnatural resonance in the ear when making certain notes. I found decided nasal obstruction on both sides, but most decided in the left nostril. This was removed, and by the time the wound was healed, his hearing was almost normal, even before the right nostril was operated upon. He still retains improvement under occasional inflations.

Case 2.—Miss P., a teacher, was referred to me by Dr. Flemming on account of deafness of two or three years' standing. Both lower turbinates were prominent. I advised operation, and removed both lower turbinates at different sittings. Her tinnitus has disapeared, and although I have not seen her recently, her physician reports her much improved in hearing, and very much pleased.

Case 3.—Mrs. B., consulted me on account of a chronic middle ear catarrh of several years' standing. Her hearing was considerably reduced, being for the watch R.—43/72 L.—3/72. On account of the chronic condition and the length of time she had been suffering, I did not give her much encouragement. I explained her case to her, and told her we could only try, and promised her nothing. I operated on the left nostril, which was not as decidedly obstructed as many cases I have examined. After the nostril was entirely healed, with the aid of a few inflations, I found her hearing considerably improved for the voice, and for the watch she heard 60/72 in right and 15/72 in left, being an improvement of 12/72 with right, and 15/72 with left. This was really better than I had expected in this case, on account of the length of time she had been suffering.

I could report other cases of like character, so that I can but feel that in treating middle ear cases without giving due attention to the nostrils, we are neglecting a most important part of our treatment.

DISCUSSION.

Dr. E. W. Fleming, Los Angeles: As he understood the paper, Dr. Trowbridge advocated nasal treatment for deafness more as a preventative than as a cure. To this Dr. Fleming agreed. He did not believe that operations for well established middle ear conditions would be of much avail. If operation procedures are advocated in these cases, they should be urged because of rhinologic reasons. If nasal obstruction did not exist, operation was not indicated. In cases of recent ear deafness, ventilation of the tube and ear could be improved by clearing nose of obstructions, but as a routine measure for well marked chronic catarrhal inflammation of the middle ear, he had not had much success by such procedure. Where there was posterior hypertrophy of the middle turbinate, then removal of posterior hypertrophy led quite frequently to improvement, so far as head noises were concerned.

Dr. C. F. Welty, San Francisco: To get at the bottom of this problem of obstruction, it was necessary to determine, first, what was to be done, and second, how was it to be done. Deafness could be classified as of three kinds, and two of these forms, viz., labyrinthine affections and oto-sclerosis, would give no response to nasal treatment. Where, however, an adhesion or catarrhal process with organized exudate binding down

the small bones was found, there a response, and an immediate one at that (forty-eight hours) might be expected to show itself. A contributing cause to deafness, be it an hypertrophy or a deformed septum was always to be removed. Prefers scissors and knives to cautery in this class of operations.

Dr. R. W. Miller, Los Angeles, took it that Trowbridge's cases were mostly children, afflicted with catarrhal deafness. Dr. Miller believed in conservatism in nasal operative surgery, for too often too great a removal of tissue leads to subsequent atrophy and loss of function of nasal tissue. A good rule would be never to destroy so much of the turbinates, that in acute rhinitis there would be an absence of contact and pressure.

Dr. D. H. Trowbridge, San Franciso: In closing the discussion, stated that it might be unwise to remove too much nasal tissue, but he had never seen a patient where such had been the case. As a rule, too little is removed.

PAPER:

MOUTH-BREATHING IN RELATION TO MENTAL AND MORAL HYGIENE.

Ross Allen Harris, M. D.

The philosopher-doctor who declared "The first condition of a successful life is to be a good animal," also affirmed "A sick man is a rascal."

In spite of numerous exceptions that test the rule, we not only find but expect to find a sane mind in a sound body, and a mind diseased in some particular, in an unhealthy body.

Of all the elements, oxygen and hydrogen in the form of air and water are absolutely essential to our existence. A man may live for a month or more without food, for three days without water, but not longer than a few minutes without air.

The all-wise Artificer has given us one mouth for the reception of food and drink, but two nostrils for the admission of air. If one nostril be stopped the other stands ready to do the work of two. If both be occluded, the mouth must needs take up a task unnatural and undesirable to itself.

The mucous membrane of the nose is eminently adapted to repel invasion by bacteria. Its cilia sweep them out as a new broom scatters dust. Its secretion will drown or collect and dessicate them. Dust and small foreign bodies are ordered back by the fine sentinel hairs. The inspired air is warmed and filtered.

A dozen micro-organisms are always normally present in the mouth. They may be numbered by millions in filthy mouths.

The saliva—the combined secretion of the various glands opening into the buccal cavity—varies from two to three pints daily. Aside from its mechanical effect in constantly flooding the oral cavity, it possesses undoubted bactericidal properties.

Nature has thus wonderfully provided against infection. Yet given a *locus minoris resistentiae*, a solution of continuity, plus the virulent micro-organism and we have the entity called disease.

The mouth-breather inspires dust and microbe-laden air, and dries too rapidly the moisture of the mouth. The immediate result is a turgescence and hypertrophy of the mucous membrane, followed eventually by atrophy. Dr. Henry Green speaks of a man who contracted conjunctivitis from the action of a draft through a keyhole upon his eye. The mouth-breather has a constant draft upon his pharynx, drying and chilling it. In this way contagious disease of every sort may be contracted, not only the catarrhal but the exanthematous.

Campbell reports three cases of iritis in which there was an absolutely negative history of either syphilis or rheumatism, but in all three there was a marked evidence of oral sepsis.

If pneumococci, or tubercle bacilli be absorbed through pathologic openings in the mucous membrane of the mouth, or swallowed in a bolus of mucus, they are carried to the lymph-nodes of the neck or the lungs. The inflammatory reaction of pneumonia or tuberculosis results.

At Portland the declaration was made that not a few of the affections of the heart valves, ordinarily attributed to rheumatism, resemble those produced by septic conditions much more closely than had been imagined. Marshall says that 90 per cent of all compound fractures of the jaw suppurate.

It is in the throat that we find local manifestations of many constitutional diseases, as influenza, diphtheria, varicella, measles, scarlet-fever, smallpox, and here it is that actinomycosis has its native dwelling place.

The causes of mouth-breathing are manifold, adenoid growths in the nasopharynx being the commonest; deflections of the nasal septum; hypertrophy of the turbinate bodies; acute or chronic catarrh; nasal polypi and neoplasms.

The diagnosis of mouth-breathing is not always easy. Of course, the facies of the common victim of adenoids and hypertrophied tonsils is ever characteristic. The drooping jaw, narrow and inactive nostrils, lustreless eyes, the partial ptosis, the crowded teeth are so diagnostic as to scarcely require mention.

But careful scrutiny will discover that many an active, bright-eyed boy or girl breathes habitually with parted lips. These intelligent youths may progress just so far in school, but will then seem to be unable to make further advancement.

The fault is laid to nervousness, to defective eyes or to innate depravity. The nervousness is attended to by drugs

containing more or less alcohol; the depravity by nagging or stupid punishments; the eyes may be fitted with quarter-diopter spherical lenses. All myopia and all astigmatism should be most accurately and constantly corrected, but the average healthy American child should be able to easily overcome one-half a diopter of hyperopia, and this action of a normal accommodation will be all the more wholesome for his future vision.

Should the drugs, the scoldings and the optician have failed to improve our patient, let us examine him as to catching cold easily, snoring, night-restlessness, a dry throat on waking, and finally with the nasal speculum, the laryngoscope or the visual organ in the tip of the index finger.

Is the mouth-breather doomed to a life-long continuance of his habit? Not if the cause be adenoids or hypertrophied tonsils. As the years pass, usually at puberty, these morbid growths will atrophy and practically disappear. Would that the harvest of their sowing might go with them. But the horrid crop remains.

The chronic nasal catarrh, the atrophic rhinitis, the mephitic ozena, the dread suppurative otitis media, or the great white plague have begun or done their fearful work.

As sequelae to these direct physical effects, and following their debility and exhaustion, are exhibited anemia, indigestion, insomnia, constipation, and rheumatism—that happy term covering a mountain range of our ignorances. And these diseases are the prophetic forerunners of neurasthenïa, the neuroses and the psychoses. The mouth-breather being out of harmony with his environment, his moral nature is bound to become perverted.

As one in every ten among the school children of our large cities will be found to be a mouth-breather, and one in five will be found to have enlarged cervical glands, we would urge the following remedies:

1. Monthly inspection of all public schools and juvenile institutions by competent physicians.

2. School instruction regarding the causes and results of mouth-breathing, with lessons in the hygiene of the mouth and nose.

3. The urging by physicians of speedy operation whenever this condition is encountered.

The mental and moral effects of the removal of the com-

monest cause of mouth-breathing was first commented on—not by a member of the medical profession, but by a layman, Mr. Edward A. Huntington, principal of a special school in Germantown, Pa.

To his instructive list of reported cases I would add these few, to call attention again to the baneful influence of this unfortunate habit upon dispositions and character.

Case I.—Charles W. Age 8. Always a mouth-breather. Catches cold easily. Chronic suppurative otitis media for six years in left ear. Enormous faucial tonsils, almost meeting together in the throat. Large adenoid mass in post-nasal space. Mother says the boy is very nervous and irritable. Cannot keep still in school. Is often kept after school for punishment. The teacher sent home a note saying the boy was always fighting.

The boy is a center of mischievous activity and cannot keep his friends long. Cries and laughs very easily. Is constantly moving hands, feet or tongue.

Operation, double tonsillotomy and adenectomy. Operation for otitis media refused. Patient's improvement in general health and in school was very encouraging for one year, though he suffered much from recurrent sore throat and breathed most of the time with open mouth. This was supposed to be a continuance of the life-long habit, but examination showed both tonsils again enlarged, the left one especially so. This one being removed while acutely inflamed the entire throat became better, though the mouth-breathing continued. The pus from the suppurating ear was examined at this time. It showed only "dead" cells of staphylococcus aureus, no streptococci being present.

The mother tried to bring about a good habit of mouth-breathing by a sort of cloth bridle which bound up the chin with buckle and strap. The device never proving very satisfactory, a strip of court plaster was pasted across the boy's lips on retiring. This effected the purpose indeed, "not wisely, but too well." Hearing strange sounds one night she entered the room where the boy was sleeping and found him writhing in a convulsion, with vomitus pouring from his nostrils. She tore off the plaster as quickly as she could (it isn't easy to remove court plaster, either) and the pillow was deluged with the remains of a hungry boy's supper, together with a quantity of popcorn he had eaten in the evening. The boy

might have been drowned by his own stomach but for this timely intervention.

The attempt at mechanical closure of the lips was abandoned, and moral suasion tried while the boy was awake, with a low pillow while sleeping.

Today the boy is a healthy-looking lad who breathes through his nose most of the time. His last deportment card in school was marked "Excellent," and almost every study showed "Good" or "Excellent." He is a manly boy, with ideals high enough to make him a favorite with teachers and playmates. He bids fair to become a useful and healthy American citizen.

Case II.—Helen G. Age 4. For two years it has been my privilege to observe this child who, but for her affliction, might well be termed a degenerate. Is not degeneracy the result of faulty habit and environment, as well as of heredity?

She is a fair-skinned, tow-haired, well-developed daughter of refined and wealthy parents. General health excellent, but always breathes with open mouth. Is sick in bed with a cold or tonsillitis every month or two. Is highly imaginative, and untruthful insomuch that her mother cannot permit her to attend Sunday school, for on her return she will invent the most impossible fictions that a morbid mind could conceive.

Her play with other children invariably ends in woe to her playmates. She is cruel. She says "I like to slap your little girl because I like to hear her cry." She is undutiful. When her mother calls her she refused to answer, remarking, "She doesn't really want me, she is just calling because she doesn't know what else to do." And, "I like to make Mary do things you don't want her to do, so she won't mind you." She is vindictive. When reproved by a neighbor she threw stones at the baby, saying she hoped one of them would kill it. Insolent to passers-by, strangers wonder at her insulting remarks or gestures. Obscene to a degree, she is the horror of every parent in the neighborhood. When she entered school last September the teacher, glad of any excuse to oust her, declared that as she could not write she must be put in the kindergarten. She is as unwelcome there; and altogether the case is a pitiful one. Her father will not entertain the idea of an operation on a child so young for a habit which she will certainly outgrow!

Case III.—Hazel P. Age 11. This very elegant young lady appeared with her mother at the Eye Clinic of the Medical College, U. S. C., for refraction. Her attire was so

startling in a free dispensary that its description may be pardoned. The latest coat, a large Gainsborough hat, white kid gloves, patent-leather shoes, and well-powdered face completed an extraordinary and unattractive picture. The mother said her daughter had always been nervous, had headaches "across her nose," caught cold easily, was irritable and could not study. The family physician thought she would be benefited by wearing glasses.

Nervous she certainly was. All children are naturally farsighted, but the most painstaking examination of these eyes showed only a trace of hyperopic astigmatism, for which she would accept no correction.

But the crowded and prominent front teeth, the parted lips, the constant sniffling, the high-arched palate, and finally the large adenoid vegetation discovered in the roof of the pharynx, showed the true cause of her nervousness. Transillumination showed both frontal sinuses dull, and this child was only eleven!

I said, "Madam, your child does not need glasses, but she does need an operation," the nature of which was explained to her. "Oh," she replied, "that mouth-breathing is only a habit. She will outgrow that. I have talked to her a great deal about it, and told her how it looked, and she isn't nearly as bad as she was."

Arguments and prophecy were alike unavailing, and the pair departed firmly antagonistic to doctors who always wanted to "operate."

How about the future weal of this child?

Case IV.—Loren S. Age 12. Has always been a mouth-breather. As soon as he recovers from one cold, he catches another. Snores a great deal. Will not keep covers on the bed at night. Irritable. In school his progress was never satisfactory. Loved to tease younger children, especially his brothers and sisters.

Nose was unusually small and ill-developed, even for a mouth-breather. Alae short and flat. Roof of mouth not especially high. Large faucial tonsils and adenoids. Uvula elongated. Operation on these abnormalities was followed by great improvement in demeanor and in school reports. But the mouth-breathing persisted. The court-plaster method of cure was in vogue at the time (it was before the disastrous experience of Case No. I). The mother tried it faithfully. She said she was alarmed one night by the weird, unnatural

sounds coming from the boy. She found him tossing, moaning and somewhat cyanotic but still asleep. She took off the plaster and the boy became quieter. It would seem as if Nature cries out for just so much oxygen and will have it whether by nose or mouth.

Loren has practiced nose-breathing by running a block with closed mouth. Gradually increasing the distance, he has not only overcome his bad habit, but has developed sturdy legs and lungs.

At this writing, two years after operation, this boy, now 14, has just bloomed into a virile manhood. He is first assistant to a busy mechanical engineer, who tells me he is the best man in his employ and will make a successful engineer.

Case V.—Mrs. G. H. D. Age 72. Earache for several nights. Tinnitus aurium constant. Catches cold very easily. Frontal and temporal headaches. Tonsils were removed 62 years ago. Catarrh for many years. Used to cry with earache when a child. Has been treated in every large city from Washington to San Francisco. Great, green, decomposing and foul-smelling crusts partly occlude both nares. Frontal and maxillary sinuses dark on transillumination. The sense of smell has been entirely lost for years. Breath fetid. Watch heard in right ear at eight inches; in left ear at eighteen inches. Both tympanic membranes retracted.

The earache soon subsided under hot irrigation, but no amount of cleansing and stimulating treatment served to do more than alleviate temporarily the nasal symptoms.

This venerable and venerated lady is convinced that she was a mouth-breather during the years of her childhood, and to this she attributes her present condition. Her ozena annoys her no more than it does other people. "Isn't it strange," she said to a friend, "that with all my catarrh there isn't any odor?" With averted head her friend answered that it was. Possessed of ample means, she could choose any hotel in the city for an abiding place, or would be welcome at her only son's palatial home in a distant town. But, self-exiled, she lives alone in a single room, doing light housekeeping over a kerosene lamp-stove.

"It's a very poor arrangement, this dying," she avers. Afraid to die, without comfort or hope, she flits about from house to house, never keeping the same address long, but always attended, wherever she moves, by this fearful "old man of the sea."

DISCUSSION.

Dr. B. F. Church, Los Angeles, congratulated the essayist on the able manner in which he had covered the subject. He was especially interested in the case histories.

Dr. H. L. Wagner, San Francisco:—Mouth-breathing was interesting from anatomic, physiologic and psychologic grounds. He spoke of ethmoidal sinus, the lymphatic vessels and the olfactory nerves and the manner in which they made their way through the cranial bones and referred to the work of Rensallers of Danzig. The laity will more willingly consent to operations once they are educated to their value in these conditions. Cited cases in the literature, all men and all drunkards, who after adenoid operations, became raving maniacs, showing close connection between nose, throat and brain.

Dr. A. L. Kelsey, Los Angeles, felt that Dr. Harris' paper should have been presented before general practitioners, since it is the general practitioners who see these cases first, and as the general practitioners are only too apt to hold to the belief that the adenoids nearly always atrophy as the child grows older, such a paper as Dr. Harris' would have rendered valuable aid in disillusioning their minds of such a fallacy. He spoke of three post-adolescent patients all well on in the prime of life, on whom he had operated for adenoids.

Dr. C. F. Welty, San Francisco, spoke of the tonsillar and pharyngeal tissue as the entrance way of infections such as tuberculosis. He cited case of a recent patient, a boy of 14, in whom tonsils had been removed by another practitioner; the operation, however, being followed by suppurative processes. An acute nephritis accompanied the local disturbance, but disappeared as the suppuration ceased.

Dr. E. W. Fleming, Los Angeles, stated that there were patients with adenoids in whom general condition was good, but who were troubled greatly by the mouth-breathing, and with whom it was very hard to get a good response from treatment. These patients are usually children, ages 4 to 10, who possess a decidedly V-shaped and narrow, hard palate. In such patients, even after the removal of the post-nasal obstructions, mouth-breathing may continue. The difficulty in dealing with the hard palate makes brilliant operative results in these cases impossible.

Dr. H. Bert Ellis, Los Angeles:—Referring to the class of patients mentioned by Dr. Fleming, stated that it was his

custom to send all such to a dentist after his own work had been completed.

Dr. Ross Harris, Los Angeles, referred to the saying of Dench, he thought it was, who made the statement "Every cold in a child is due to an adenoid." No child was too young to be operated upon. His paper had not been intended to be technical, but was intended rather to show the disastrous effects of non-interference at the proper time. The importance of early operation in this class of patients cannot be exaggerated.

Presentation of Specimens:

SECTION OF TEMPORAL BONE; TEMPORAL BONE OF CHILD; METAL CAST OF EAR.

Hill Hastings, M. D.

Dr. Hastings presented the following specimens for inspection and consideration:

1. A section of the temporal bone showing productive osteitis of aditus and antrum.

2. The temporal bone of a child at birth, showing the high position of antrum and exit of the facial nerve.

3. A metal cast of the ear, including the mastoid cells, cochlea and semicircular canals.

The last specimen, he said, was one of many he had made, most of them having been failures, and was almost perfect. He said that he had made the casts after Politzer's method, but found it was necessary to bore a hole in the superior semicircular canal to provide an air vent before pouring in the hot metal through the meatus. Otherwise the labyrinth was not completely filled. The child's temporal bone, he said, showed another point, namely, the mastoid-squamous suture, in which was situated the antrum. He wished particularly to state that it was a misconception to regard the antrum as a part of the mastoid process. It is rather a part of the middle ear, as was shown by the specimen. Furthermore this conception, which was by no means original, he said, is significant in getting a correct idea of inflammatory conditions of the middle ear. The general practitioner is apt to believe that when the "mastoid antrum" is involved in the course of a suppurative otitis, the ear trouble is then dangerous. As a matter of fact, he believed that the antrum, as a part of the middle ear, is inflamed in every case of suppurative otitis media. Its mucous membrane lining is continuous through the short aditus with that of the cavum tympani, and it is quite unreasonable to suppose that a suppurative inflammation of its mucous membrane should stop at an imaginary boundary line between the tympanic cavity and antrum, and that the antral mucous membrane would remain normal.

If this fact is generally known, the necessity for an early incision of the drum membrane will be more impressed on the mind of the general practitioner, as the best abortive measure against mastoid involvement.

PAPER:

AN OPERATION FOR THE PAINLESS AND BLOODLESS REMOVAL OF SUBMERGED AND ADULT TONSILS.

FRANCIS B. KELLOGG, M. D.

The procedure which I am about to describe is in reality a modification of Pynchon's galvano-cautery dissection. In the modification, however, the role played by the cautery is less important than in the original.

Indications:—It is especially effective in the removal of the so-called submerged tonsil. It also has obvious advantages in the removal of adult tonsils of any class. It is in the removal of the adult tonsil that troublesome hemorrhage is most often met, and it is a matter of no small moment to be able to practically eliminate this disquieting feature.

The operation is also well adapted to the cases of submerged tonsillar stumps which are not infrequently left after tonsillotomy in children. These stumps do not usually require attention until the child has attained sufficient age to co-operate with the physician; a very essential condition precedent to the operation.

Technique of the Operation:—The tonsils and pillars are first brushed with a 10 per cent solution of cocain to secure superficial anesthesia. A few drops of a mixture of beta-eucaine lactate 12 per cent. and adrenalin 1-1000 equal parts is then drawn into a Pynchon tonsil syringe. The needle is pricked through the membrane of the anterior pillar at its middle point, and a drop of the mixture injected under the membrane.

Care must be taken not to prick through the pillar. If the membrane only is penetrated a bleb will be raised by the injection. This is repeated above and again below to cover the entire pillar. If the prick of the syringe is slightly felt at the first injection, the second and third are not felt, as a result of the first.

The anterior pillar is injected for the reason that it is liable to be touched by the cautery, and is much more sensitive than the tonsil itself.

After injecting the pillar, the needle is plunged into the stroma of the tonsil at different places, and a very little of the mixture injected at each point. Here, too, care must be taken that the point of the needle does not terminate in a crypt from which the anesthetic escapes into the throat. In the latter case it can be seen running out. The tonsil after injection presents a pale, bloodless appearance. Personally I have used a mixture of equal parts adrenalin 1-1000 and cocain 10 per cent, and have never had any constitutional symptoms except in one case, that of an anemic wash-blond of a decidedly neurotic type. In this case the threatened syncope was averted by prompt measures. Since learning of beta-eucaine lactate, however, I would recommend using it in place of cocaine as the safer agent.

The tonsil is now seized with volcellum forceps at the upper third and drawn out of its recess, and at the same time pushed slightly back toward the pharynx to put the attachments to the anterior pillar on the stretch. A galvano-cautery knife at white heat is now entered at the top between the tonsil and the anterior pillar and passed downward, hugging the tonsil, and separating it well from the pillar. The tonsil is then drawn inward and forward and the process repeated on its posterior aspect. At the upper part the cautery dissection is carried deeper, as it is important to completely separate the tonsil from the supratonsillar fossa. In this manner the tonsil is partially enucleated by the cautery. Instead of being a sessile body it is now pedunculated simply being attached to its bed at the base. At this point the cautery is abandoned, and the loosened tonsil drawn into the fenestrum of a Mathieu's tonsillotome, and the enucleation completed.

A Mackenzie tonsillotome would be equally efficacious, and a wire snare would perhaps be better than either. It would still further preclude the possibility of hemorrhage, although it would probably increase the reaction.

I have never seen any tendency to secondary hemorrhage after this operation, and believe it to be effectually prevented by the cautery, while the primary is taken care of by the adrenalin and cautery combined.

I have used this operation upon children as young as ten years of age, and had them come up smiling for the second tonsil a week after the first.

It is the proper treatment for diseased adult tonsils with a tendency to cholesteatomatous accumulations in the crypts.

DISCUSSION.

Dr. W. H. Roberts, Los Angeles, said he never attempted the cautery, but advocated the snare. He thought the snare safer, as the tonsillar artery might be large; used ether as an anesthetic and operated always with the patient in the sitting position.

Dr. W. D. Babcock, Los Angeles, agreed in the use of the snare and thought the cautery unnecessary.

Dr. E. W. Fleming, Los Angeles, thought it difficult under general anesthesia to use the cautery, and that children resent an operation without anesthesia. Referring to Dr. Miller's paper, he considered tonsils as portals of tubercular and other infections, and that when diseased their removal was indicated. Many tonsils were diseased even though they did not seem to be enlarged or prominent.

Dr. C. F. Welty, San Francisco, referred to the rheumatic symptoms from tonsilitis, being additional indications for their removal.

Dr. H. L. Wagner, San Francisco, stated that he had made investigations, while in Wurzberg, of the tonsil and adenoid, both as to their strúcture and their absorption properties. He believed that they were fetal structures, and as such have no office to perform in after life. He had confirmed the experiments regarding the transmission of colored particles, and said the tonsil is, as it were, a lymph heart. He expected to show at the next State meeting a dog's lung, in the apex of which are colored particles that were absorbed by the tonsils and transmitted to the lung.

Dr. Hill Hastings, Los Angeles, quoted a report of Dr. A. J. Lartigau from the Pathological Department of the Columbia University, who made a study of hyperplasia of the tonsillar tissue, especially in reference to the possibility of tuberculosis infection. Dr. Lartigau's conclusion were: "Primary tuberculosis of adenoids is probably more common than most previous studies show. Sixteen per cent of our series contained tubercle bacilli, 10 per cent with characteristic lesions of tuberculosis. The tubercle bacilli were present in small numbers. The lesions in primary tuberculosis of the adenoid are generally close to the epithelial surface and focal in character. Occasionally they may be found in the deeper parts of the pharyngeal lymphoid tissue. It is probable from

our experience that many later investigations will show primary tuberculosis in 10 per cent or over of the clinic cases."

Dr. H. A. Kiefer, Los Angeles, emphasized that a complete removal of the tonsil is a difficult operation and that a rheumatic history is often found in chronic tonsillitis.

Dr. F. B. Kellogg, Los Angeles, said that there are advantages of an eschar. The cautery causes a sear which most effectively destroys tonsillar tissue that might be left by a cutting or snare operation. The soreness is never more than from the use of a knife, for the cautery only separates the adhesions.

PAPER:

INDICATIONS AND CONTRAINDICATIONS FOR INTRALARYNGEAL OPERATION IN TUBERCULOSIS OF THE LARYNX, WITH REPORT OF THREE CASES.

CULLEN F. WELTY, M. D.

Because of the climate of Southern California, a great many people with tuberculosis of the lung make this their permanent home. Others who are not so fortunate come to this climate during the time of the disagreeable weather at their own homes. Because of this fact, the laryngologists of this section have an exceptional opportunity of observing these cases of laryngeal tuberculosis, and it is for this reason that I present this paper at this particular place.

The percentage of laryngeal tuberculosis in lung tuberculosis is estimated very differently by different observers. M. Schaffer, 97 per cent; Lubinsky, 60; Froumel, 40; Morrell Mac Kenzie, 34; Heinze, 30; Schech, 30; Gaul, 27; Frey, 26; Krieg, 26; Buhl, 16; Willigk, 14. Probably about 33 1-3 per cent would be a fair average. Age, between 20 and 40 years. More male than female. Seldom under 12 years.

It is well to mention at this place the various pathologic lesions that are likely to be found in this class of patients, that demand surgical interference (in order of frequency).

First—Edema of the arytenoids and epiglottis. Second—Thickening and ulceration of the posterior laryngeal wall. Third—Infiltration and ulceration of the false cords. Fourth—Ulceration of the epiglottis. Fifth—Thickening and ulceration of the true cords. Sixth—Granulomata supported by a pedicle should be removed in all cases.

Heryng and Krause are probably the most radical operators in the world, Hervng, the most radical of all, operating all cases. Morris Schmidt and Sheck are somewhat less radical than the former. However, they find a few more indications for operation than Hajek.

For convenience I have made a classification that may help somewhat for getting at the various indications for intralaryngeal operation.

Laryngeal Tuberculosis	Primary	All operated.		
	Secondary	Without laryngeal symptoms	Do not operate.	
		With laryngeal symptoms	Active	Operate only to make the patient more comfortable.
			Passive	Operate to cure the patient.

Tuberculosis of the larynx divides itself very naturally into primary and secondary affections. By primary affection we mean that tuberculosis does not exist elsewhere in the individual. These cases are rare and very difficult of diagnosis. Once certain of the diagnosis, the only thing to be thought of is operation. The more radical the operation, the more chance the patient has for complete recovery.

By secondary affection we mean that there is tuberculosis elsewhere in the body, and that this local manifestation of the disease has been brought about in one of three ways (in order of frequency), lymphatics, blood, expired air and mucus.

The secondary affections are further divided into those without laryngeal symptoms and those with laryngeal symptoms. By laryngeal symptoms I mean pain, cough and dyspnea. Pain may be so intense that the patient will not swallow and from necessity will not eat. It does not take long to reason what will naturally follow. Pain usually induced by edema and ulcerations. Cough may be so severe that it continues to add to the already inflamed and thickened mucous membranes. Cough is primarily induced by ulcerations, edema and mucus secretions. Dyspnea may be so severe that it alone threatens life. When it is so marked as this, the only safe procedure is a primary tracheotomy. The cause of the dyspnea will usually subside with the rest that naturally takes place to the

larynx following tracheotomy. Dyspnea is usually induced by edema and infiltrations.

The cases without laryngeal symptoms we do not operate upon, because the local condition is not causing any inconvenience or annoyance. It occasionally happens that individual cases may change their grouping as the disease either progresses or improves. However, there are many cases in this class that recover completely without surgical means.

The cases with laryngeal symptoms are further divided into active and passive. By active I mean that the tubercular process in the lung is more or less active, that the patient has a temperature of more than 100° F., and is losing weight rapidly. By the passive I mean that the tubercular process is more or less quiescent, temperature below 100° F. and only slight loss of weight.

In the active classification the patients are only operated to be made more comfortable. You do not operate to save the life of individuals. However, you can assure them with certainty that they will be more comfortable the balance of their lives. Some of the cases so operated seem to be followed by a more active manifestation of the primary affection. Heryng, Krause and others think this is simply a coincidence, while others, notably among them Hajek, think this is directly caused by the operation. This condition does happen, and we should be prepared for it, as the patients die in a few days. However, most of the cases so operated feel so much better that they entertain hopes of complete recovery. Usually the lung condition goes on the same as before, and the remaining days are free from laryngeal symptoms, which adds very much to the comfort of the individual.

In the passive or the quiescent condition, a great deal may be accomplished by intralaryngeal operations, in fact, they are the cases of selection. In these cases we operate to cure the local condition, and in many instances this is accomplished. By destroying the field of infection the cases may entirely recover. It is assumed that the tuberculosis of the lungs is in a quiescent condition, and by such an operation you place the patient in the best possible condition for complete recovery, because the field of infection has been destroyed. In fact, so much can be said on this particular phase of laryngeal tuberculosis, that chapter upon chapter has been written upon the subject. Pain is very important in this classification and must

be relieved. Cough is more important under this heading than in the preceding, because it is usually induced by the local condition. Should the cough be allowed to continue, the chances of renewed infection are increased.

If dyspnea is present, an intralaryngeal operation should not be attempted, because the added irritation from the operation will so inflame and congest the parts that there is danger of suffocation from laryngeal stenosis. In such cases a primary tracheotomy is always indicated.

A short time ago I noticed an article in one of the special journals recommending intubation in such cases. I only mention this to condemn it.

About four years ago I was fortunate enough to see a case of laryngeal tuberculosis suffering from dyspnea, which was induced by infiltration of the false cords and thickening of the posterior wall.

The thickening of the posterior wall was removed, and the patient was requested to wait for an hour. One-half hour after the operation there was complete stenosis of the larynx. A rapid tracheotomy was necessary to save the life of the individual. This case was so instructive to me that I will never do an intralaryngeal operation if dyspnea is present.

Sometimes, following an operation in this passive group, the patients seem to have a renewed infection with rapid rise of temperature, lose weight rapidly; in fact, all the symptoms of an acute exacerbation of the old lung condition. This lasts for a week or two, and they gradually get back to their former condition. Their improvement is largely dependent upon the condition of the lung, and upon the complete removal of the tubercular process in the larynx. I have not seen any of these patients die for months following.

Partial or complete removal of the larynx for laryngeal tuberculosis I mention simply to condemn, because it is not necessary, and because the mortality of such an operation is of necessity very high, and because the laryngeal disease is only the local manifestation of tuberculosis elsewhere.

You no doubt have noticed, and will probably take exception to, the fact that I have not spoken of the tubercular process of the lung. If you follow this classification of laryngeal tuberculosis you will find that it is unnecessary, and you will be able to recommend different procedures regardless of the lung condition.

I do know that a great deal of good can be accomplished by the proper procedure. I have arrived at these conclusions by personal experience of four years along this line of work. I have operated on thirty or forty cases, comprising eighty or ninety different operations. I have also had the opportunity of observing three times this number of cases, and these observations have led me along the enthusiastic line of which I speak.

Case I.—Male, age 29, undertaker by occupation, married, two healthy children, wife in good health, father mother, two brothers and one sister well and healthy; one brother died of tuberculosis at the age of 25. The patient has been perfectly healthy until two years ago, when he began to lose weight and had a slight cough. This cough has increased to such an extent that he is coughing practically all of the time. During the last year he has lost about 25 pounds, has an occasional night sweat, his temperature does not reach 100° F. On laryngeal examination, I find decided thickening of the posterior wall, which is ulcerated; slight edema of the arytenoids. Removal of the posterior laryngeal wall, cauterized with 80 per cent lactic acid. For the next thirty days there was not so much cough, and apparently he was much improved. Up to this time he remained in San Francisco attending to his work, which necessitated his being out a great deal at night. Six weeks after the first operation he had high fever, night sweats and rapid loss of weight, and a cough that was almost as severe as when he first consulted me. At this time there was decided edema of the arytenoids, which was not interfered with. The patient was sent to the mountains, where he would be in the open air the whole twenty-four hours. Returned in one month somewhat improved, occasional night sweats; was not losing weight, was not gaining; temperature 100° F. The cough seemed to be the only annoying symptom of which he complained. The arytenoids were more edematous than before. I scarified, which gave him relief lasting for ten days. He returned to the city at the end of thirty days in practically the same physical condition that he was in thirty days before. The edema was considerably increased: it was increased to such an extent that I advised a tracheotomy at once. He had considerable dyspnea and almost complete stenosis. He would not submit to operation, so I told him I could not continue to treat him if he would not follow my directions. He died some six or eight months later.

Case II.—Female, age 38, married, three healthy children, husband healthy, her family history negative, poor hygienic surroundings. Healthy until one year ago, then she developed a cough and lost weight rapidly, had night sweats and daily temperature. In about three months was very much improved and gained some weight, did not have night sweats; no temperature. The cough continued and she began to have pain in the larynx. The pain in the larynx has persisted, and in fact has grown more severe in the last month; at times the pain is so severe that she can scarcely swallow. She would like to eat, but will not, because of the intense pain. A decided thickening of the posterior wall, with an ulcerating surface, was found; this was removed the following day and cauterized with 80 per cent lactic acid. The day after the patient began to eat and has had no laryngeal symptoms since. She gained twenty pounds in four weeks, and from appearances is perfectly well.

Case III.—Male, age 42, clerk by occupation, married, no children, never robust, however, was never confined to bed by illness; parents, brothers, sister and wife healthy. About one year ago he had influenza, from which he did not completely recover. It left him emaciated, weak and with a cough. He had daily temperature, night sweats occasionally. About six months after his attack of influenza he began to experience pain in the larynx when he coughed. This pain increased gradually for three months, until he consulted me. He said that it was so painful for him to swallow that he had not swallowed a thing for five days; besides this, he had night sweats, losing weight rapidly. The cough at this time was very persistent and would prostrate him very much because of the pain induced.

Examination.—Half of the epiglottis had been destroyed by the tubercular ulceration, otherwise the larynx was reddened. I told the wife what I found, what I proposed to do, and what would happen. They insisted that I should proceed at once, which I did, removing the ulcerating surface of the epiglottis, which included practically the whole of the epiglottis, cauterized with 80 per cent lactic acid. I then gave the patient two glasses of malted milk, which he drank with a relish. In a few days he was taking semi-solid food; in the course of a week he was taking solid food. He began to have some pain about ten days after the primary operation. On very careful examination

I discovered a few points of granulation tissue in my former field of operation. They were removed, and their surfaces cauterized by lactic acid. The only annoying symptom that this patient had after the primary operation was the accumulation of mucus in or about the larynx. This was relieved by an alkaline spray. The patient lived sixty days from the time of the first operation. So far as his larynx is concerned, he was perfectly free from all laryngeal symptoms, which no doubt contributed much to the comfort of his remaining days.

PAPER:

EUSTACHIAN CATHETERIZATION THROUGH THE MOUTH, WITH REPORT OF AN ILLUSTRATIVE CASE.

HUGO A. KIEFER, M. D.

Eustachian catheterization via the oral cavity is a method we meet with but very seldom in actual practice. I have met with only a few gentlemen who professed to use it. It is a method not to be recommended for the ordinary run of cases requiring catheterization, as the methods of Kramer, Deleau and others, utilizing the nasal passages as a way of ingress, is much easier of performance and requires less time. But it is too valuable an adjunct to be deserving of the extreme neglect that has been accorded it. We meet with occasional cases in which the methods above named cannot be utilized on account of nasal obstructions, and for such cases it is very fortunate that we have recourse to the method under discussion.

The technique is not difficult, and can easily be acquired by any one skilled in the use of the rhinoscopic mirror. The oro- and naso-pharynx and soft palate should first be anesthetized. The patient then depresses the tongue with an ordinary depressor, the surgeon manipulates the mirror with one hand, and with the other hand inserts the catheter into the orifice of the Eustachian tube, using for this purpose a metal or rubber catheter (I prefer silver), which should be bent in a long curve at the distal end to almost 90 deg. from the shank. Then withdrawing the mirror and laying it aside, he can use that hand for the manipulation of the Politzer air bag, which should be armed with a rounded hard-rubber tip, which will fit in and close, but not wedge in the orifice of the catheter. The principal difficulty lies with patients who cannot relax the palate sufficiently to afford a view of the nasopharynx. This difficulty, when it exists, can usually be overcome by a little training and persistence, and the use of a local anesthetic, though

there are some cases in which it seems impossible to accomplish this. The palate retractor may be tried in such cases.

Incidentally it can be said that this method is cleaner and involves less danger of carrying infective material into the middle ear than when the catheter is carried through the nasal chambers. How often on passing a catheter through a nose apparently well cleansed, and withdrawing it again without forcing air through, may we find a plug of mucus obstructing its lumen.

The following case will illustrate about the class of patients to whom I would, and do, restrict the use of this method:

J. C., aged 38, farm hand, presented himself for treatment of the right ear, which troubled him with "fullness," and "ringing," and "some pain" for two days past. Contracted a cold in the head one week before this, from which he had almost completely recovered. General health good. Has always had difficulty in breathing through the nose. The right tympanic membrane is bulging, transparent, slightly injected at the margins and presents evidence of serous fluid behind it to the level of the umbo. Very little tenderness at the tip of the mastoid; Rinne negative; temperature 99° F. Simple chronic nasopharyngitis, with some evidence of the recent coryza. Both of the middle and inferior turbinates are much enlarged; a cartilaginous and bony spur on the right side of the septum; deflection of the cartilaginous septum to the left.

Repeated attempts at Politzerization failed after the application of adrenalin and cocain to the orifice of the Eustachian tube; catheterization of the tube through either nasal chamber impossible on account of the nasal obstructions. Catheterization through the mouth was tried, after cocainization, with perfect success and the tympanum inflated. This was practiced daily for a period of six days. Thereafter inflation became possible by the Politzer method, which was employed every other day for ten days, the patient making an uneventful recovery.

It may be added that the patient refused absolutely to have any operations on his nose, thereby exposing himself to the necesity of having the same method adopted in case of a recurrence of the middle ear inflammation.

DISCUSSION.

Dr. F. B. Kellogg would like to see the curve of the catheter referred to.

Dr. W. D. Babcock said the same procedure was done at the Manhattan Eye and Ear Hospital some time ago.

Dr. W. H. Roberts said Kyle had an outfit for the same and he saw him use it.

Dr. A. L. Kelsey had catheterized through the opposite nostril.

Dr. H. A. Kiefer closed by acknowledging his indebtedness to Dr. Kyle for the idea he followed out.

PAPER:

THREE FATAL CASES OF MENINGITIS WITH PECULIAR EAR SYMPTOMS.

W. H. Roberts, M. D.

These cases with their post-mortem findings are reported in the hopes that what is learned may be of benefit to us all, and particularly that from the last two we may learn to look earlier for symptoms of meningeal involvement.

The first is chiefly of interest because the autopsy so clearly confirmed the diagnosis made over a month before death, and because of the remarkable condition found in the middle ear.

The last two, I think, teach among other things, that we should never examine an ear with an acute otitis media without keeping ever before us the possibility of a meningitis developing in spite of the proper treatment being instituted. We should therefore always be guarded in our prognosis in all acute middle ear inflammations.

Case 1.—On January 20, 1905, W. H., age 50, came under my care bearing the following letter from his physician in the country:

"Dear Doctor:—The bearer came to me about two months ago with neuralgic pains in and about the left ear and brow, and in a general run-down condition, which I attributed chiefly to a very septic condition of the mouth. He has had the pains off and on since that time, has continued weak and hardly gains at all. About a week or ten days ago, swelling, slight redness and tenderness on pressure over the mastoid tip came on. There has, at no time, been any discharge from the ear. Evening temperature has been slightly raised for some time and pulse about 100. Deafness was about complete when he came to me, although he says he had quite recently received telephone

messages with that ear. Watch tick audible about eight inches on the other side, but today it is almost deaf to watch tick. I blistered over mastoid twice when he first came to me."

On examination I found the entire mastoid tender, considerable edema of the tip and neck, drum dull, thickened, but not in the least congested. No evidence of perforation, no sagging of the canal, very marked degree of deafness. Temperature 99.8.

Diagnosis: Mastoiditis with Bezold perforation of the tip.

I advised patient to go immediately to the hospital and expected to operate that evening. The patient consented, but expressed a wish to return home for an hour or two in order to attend to some necessary business before going to the hospital. Nothing more was seen of him until the morning of the 24th of February, when a telephone message was received from his home in the country, saying that he was in a very bad condition—dying, it was feared.

On my arrival there I learned that the man had been losing ground steadily for some weeks, although complaining less and less of pain around his ear until within the last two or three days, when he remained in bed most of the time with hot applications to the ear. The morning before, he complained of very severe pain in the small of his back, which he had injured some years before by being thrown out of a buggy. Toward evening he became rather irrational, with a slow pulse in the neighborhood of 60.

All night he was exceedingly restless and on the morning of the 24th he could only be aroused with difficulty. I found skin cold and clammy, patient groaning, throwing himself from side to side in the bed, and at times holding his hand to his forehead and left ear. Pressure over the mastoid made him wince, and on asking if it hurt he replied "Yes," the only intelligent answer obtained. There were no facilities in the house for making a satisfactory examination, but because of the slow pulse I thought there was the possibility of brain abscess, and as the sons wished to take the chances of an operation, I had the patient taken to the hospital in an ambulance, where I saw him at five o'clock, with Dr. Hill Hastings, of Los Angeles. Temperature 102 deg., pulse 100. The entire condition had changed, patient then showing signs of active meningitis. Lumbar puncture obtained turbid serum which contained the

pneumococcus. I refused to operate and put an ice pack to his head. Patient died at five o'clock the morning of the 25th.

Autopsy was performed that evening by Dr. Stanley P. Black and myself. Found a diffuse purulent leptomeningitis, most intense at the base of the brain. No signs of abscess. The dura was exceedingly adherent over the left temporal bone, particularly over the petrous portion, and a perforation existed over the roof of the mastoid antrum. The bone was very congested over the antrum and middle ear and much softened. On opening the antrum I found it filled with pus, as were all the mastoid cells, which had practically broken down, forming one large cavity. The probe passed readily through the perforation at the tip of the mastoid and three inches into the neck. After removing the softened superior wall of the attic the middle ear was found entirely normal and dry, mucous membrane not adherent, stripping readily from the bony walls, and the ossicles in good condition.

This man's life was sacrificed by his obstinate determination not to go to the hospital, or to submit to an operation. After his return home his physician and his sons tried to persuade him to follow my advice, but without avail.

Case 2.—Miss L. H., age 25; occupation, dressmaker. I first saw her at 9 p. m., August 7, 1903, by request of Dr. A. T. Newcomb, and the following history was obtained:

For over a year had had spells of dizziness, worse particularly the past month. One month prior to this she had fainted. For four weeks she had had a great deal of pain in her back and had been under a physician's care for sciatic rheumatism. During the latter part of this time she had been running some temperature. On the morning of August 1st she had shampooed her hair and that day some tonsillitis set in. On the fifth she called at Dr. Newcomb's office for treatment for her tonsils. That morning she had some neuralgic pains in her right ear. In the evening the pains became very severe in the ear and over that side of her head. By ten o'clock the pains had begun to quiet and the following morning the ear began to discharge some straw-colored serum. From that time on she had no more pain in her ear.

I was called by Dr. Newcomb to see the patient because of some mastoid tenderness. Examination revealed the following:

The patient was excessively nervous. The muscles of the

right side of the neck were quite tender, but very slight mastoid tenderness. The external auditory canal contained some whitish flakes which were removed by syringing. The drum was exceedingly congested and thickened so that I was unable to make out the landmarks. The middle ear was full of straw-colored serum (no pus), which was removed by Politzer inflation and pneumatic speculum. This improved her hearing and made her feel more comfortable. The patient also complained of very severe pain in the back of her neck, in the cervical region, and severe frontal headache. The pupils were normal. The ear was dressed with a cotton wick containing glycerine and carbolic acid. On the following morning I learned that the patient did not sleep until about 3 a. m. She had no pain in the ear since the treatment. The cotton pad outside the wick was wet with straw-colored serum, no secretion in the canal and none came from the middle ear by Politzer inflation, or pneumatic speculum. She was complaining of intense pain in the cervical and lumbar regions and also the frontal region of her head. She had some abdominal tenderness. Temperature 102.6, pulse 96, pupils normal. The patient looked very sick and was removed to the hospital for better treatment than she could receive at her home. At 2:30 that afternoon at the hospital, she seemed to be in a condition of collapse. Her features were drawn, pulse weak, temperature 103.8 (rectal). I found a slight amount of pus in the canal, from which no culture was made as the swab was lost. Shrapnell's membrane red. I performed paracentesis under chloroform, but got only blood. Under the chloroform her pulse became very weak, and it was necessary to give strychnin injections (hypodermic) and oxygen inhalations with normal salt under the breasts. She had a peculiar eruption over the abdomen and complained of intense pain in the back of the neck, lumbar and frontal regions. Symptoms now all pointed to meningitis. On the morning of the 9th, a lumbar puncture was made, showing almost pure culture of the pneumococcus, leucocytosis of 35000. In the afternon her right pupil became dilated. Death occurred at 7:30 p. m. Patient retained consciousness almost to the last.

Autopsy.—On removing the skull cap, the right hemisphere was found bathed in pus, which had traveled down the right optic nerve. On inspection, the right petrous portion of the temporal bone appeared to be normal, but on a slight tapping

with the chisel the whole bone caved in, being entirely necrotic, filled with pus and granulation tissue. The mastoid was not opened, the autopsy being performed by a novice, who, in his carelessness, destroyed the petrous portion of the temporal bone, thus losing much valuable information. This patient had had no pain in her right ear until four days before her death. If the temporal bone had become infected on the day the pain in the ear began, was there time enough for the petrous portion to become entirely necrotic? Was there not rather primary osteomyelitis here with secondary involvement of the middle ear?

Case 3 is reported in detail, as it presents some very inter esting symptoms, which in a great measure deceived the physicians who were called in on the case.

I was called on the morning of January 11th, 1905, to see F. M., age 15, who was suffering from acute pain in the left ear, which had started about 2 o'clock that morning, lasting until 5, when the ear began to discharge some serum.

When examining at 8 o'clock, I found intense congestion of the drum, with bulging, a small pin point perforation at the middle of the drum, which seemed to be blocked with secretion. Under chloroform anesthesia, the left drum was opened freely evacuating large quantities of bloody serum. The patient at once went to sleep and slept the rest of the day in perfect comfort, the ear discharging well.

The following ear history was obtained: He had had frequent attacks of earache, the last attack being about Thanksgiving, when his right ear ached for some little time and then discharged pus for a few days. At this time his ear was treated by syringing, but was not under the care of any specialist.

Before incising the left drum, the right was examined and some congestion of Shrapnell's membrane found. Also a slight ring of congestion extending nearly the entire circumference of the drum. He had no pain whatever in this ear, but his mother was advised to apply a hot water bag to it, which she forgot to do, as he was so comfortable. At 5 p. m. the boy's temperature was 103.3, pulse 116. Right drum not as much congested as in the morning. The left ear was discharging freely and was perfectly comfortable.

On calling the next morning, I found that during the night the right drum had ruptured without any pain or warning,

discharging yellowish pus with some odor. The left was comfortable and draining nicely. Temperature 100. The patient was given calomel purging, and bichlorid douching for each ear. At 6 p. m. I learned that his temperature had been high all day, reaching 104 several times. He was free from pain, both ears discharging copiously with slight tenderness of mastoid on the right side. January 13th, temperature at 8 a. m. 101, ears discharged freely during the night, but both throbbed with sensation of dull pain that morning. I syringed ears with bichlorid solution, getting away considerable secretion, with relief from pain and throbbing. Temperature reached 104, pulse in the neighborhood of 100. January 14th, his temperature kept high all day, but his ears were comfortable and discharged freely. Politzer inflation was used with good results. From this time on his ear symptoms gradually improved, the discharge grew less daily and ceased by the 25th.

On the 14th a consultation was held with Doctors King, Black, and Sherk, to discover, if possible, the cause of the high temperature, but nothing was found. The boy felt perfectly well, his only complaint being that we did not allow him enough to eat, and he continually expressed a desire for beefsteak. He was unable to sleep much after the first day of his illness. January 15th he seemed to be better, but his temperature ranged from 102.5 at 6 a. m. to 104 by axilla at 4 p. m., and at 8 p. m. was 102. January 16th, aside from his temperature, he was much better. The range was from 101.3 to 103.4. January 17th, highest temperature was 103.2, lowest 101.8. On the morning of the 18th his temperature was 100.8, but by 4 p. m. had reached 103.6.

Dr. J. M. McBride saw him in consultation, but could not account for the fever, and gave a very hopeful prognosis.

January 19th, his temperature reached 104.5 at noon, and a bath brought it down to 101.8, but it immediately began to go up, and at 8 p. m. was 104.6. At this time Dr. Hill Hastings was called in consultation to see if he thought there could be any ear complication to account for the temperature. He found the ears in good condition and apparently not accountable for the febrile condition. He, however, found some fibrillary twitching of the fibers of the pectoralis major muscles on drawing the fingernail quickly across the muscle; there was also a marked Koernig. The pupils were even and active, and there were no mental disturbances of any kind. He

made a diagnosis of meningitis, not of otitic origin, but probably due to an influenza infection. His prognosis was unfavorable.

Those of us who had been seeing the boy could not bring ourselves to agree fully with him in spite of the evidences of meningeal irritation. We were inclined to view these meningeal symptoms as a result of the febrile condition and not the cause. On the 20th he was about the same. Frequent baths kept the temperature under 103.5 most of the time. January 21st he was not so well. Dr. Sherk did a lumbar puncture, but failed to get fluid. His temperature reached 105, and then, on Dr. McBride's advice, small doses of acetanilid were used, and his temperature stayed at 104. His pulse all this time was about 100.

January 22d. On the morning of this day he complained first of some lumbar pain, due to the puncture of the day before. At noon there was noticed occasional twitching of the body, and that afternoon he spoke of pain in the back of his head. That night he also complained of headache.

January 23d. Early in the morning he had a nosebleed. Later he refused nourishment. He could not sleep, but was not in any pain. Later in the morning he spoke of pain first in the top of the head, then, in a few hours, all over head, and also in the lumbar region. Symptoms of meningitis were becoming more prominent, but his pupils were normal and he kept pretty rational. That afternoon he awakened from a sleep in a sort of a night terror, and it took some time to quiet him.

On the morning of January 24th there was frequent jerking of the legs and constant fumbling with the hands. He had a comfortable night, was free from pain, complained some of his back when he moved and was quite irritable when disturbed. That evening there was pain in his back, extending downward from waist line, and turning caused pain in his neck. Later that night he became irrational at intervals.

January 25th I reopened both drums under chloroform, with negative results. That evening there was some serous discharge from the left ear. He gradually became more restless, would pick at bed clothes and mutter when asleep, and became more and more irritable when awake.

January 26th, his neck was stiff and would hurt him on turning. There was a profuse serous discharge from the left ear in the morning.

January 27th, he was rational when awake, but very restless when asleep. Once in the afternoon there was considerable serous discharge from his left ear, but from this time on it was very scanty.

January 28th, he was restless during the morning. At 2 p. m. he said he was very thirsty. He sat up to take a drink of water, and after drinking said, "Why, I can't see," and fell back on his pillow unconscious. Active delirium then set in, his abdomen became distended, he voided urine involuntarily, and at 2:10 on the morning of January 29th he died.

Autopsy that afternoon by Dr. Stanley P. Black and myself revealed a rather diffuse leptomeningitis, most marked at the base. There was no apparent meningitis in either temporal region. There was no necrosis of either temporal bone. Both mastoids were normal. The left middle ear contained a slight amount of serum. There were no evidences whatever found to lead us to think that the meningitis was of otitic origin. Cultures taken from the cerebro-spinal fluid showed the streptococcus.

PAPER:

DEMONSTRATION OF SEQUESTER OF THE TEMPORAL BONE OBTAINED DURING A MASTOID OPERATION.

HENRY L. WAGNER, M. D.

The history of this case of traumatic mastoiditis is briefly as follows:

A perfectly healthy man, forty years of age, in falling from his wagon struck the back of his head upon the roadway. He bled from the nose, ear and mouth; unconscious for a few hours, intense swelling and pain, principally on the left side of head behind the ear, combined with fever. Patient under treatment by his family physician for some weeks. During this time spontaneous serous discharge from the middle ear, which later became purulent. Two months from time of accident patient came to my observation. He then had regular pulse, no fever, nor pain over mastoid region by pressure, only a very copious purulent discharge from the ear, indicating that the mastoid antrum was apparently the source. Microscopic analysis revealed streptococci. During the extensive mastoid operation, I found the periosteum very adherent to the bone, indicating a subsided periostitis. The larger part of the mastoid bone was removed from the zygomatic cells, including them, clear to the tip of this bone, disclosing a pneumatic structure and this sequester was found in its petrous portion. In removing the sequester both of its ends were broken off; it now measures two centimeter in length and one in width, and it was at least a centimeter longer before being broken. Whether this sequester had been formed by the process of streptococcic osteomyelitis, or by fracture, or by both, is difficult to say. The patient made a slow but uneventful recovery. Directly after the operation not the slightest trace of pus was observed to come from the middle ear.

BUSINESS MEETING.

The twelfth annual meeting of the American Laryngological, Rhinological and Otological Society met at the Midland Hotel, Kansas City, Mo., and was called to order by the President, Dr. James E. Logan, of Kansas City, Mo., on Monday, June 11, 1906, at 10 o'clock. During the sessions of the Society the following Fellows registered:

C. W. Richardson, Washington, D. C.
W. C. Bane, Denver, Colo.
H. W. Loeb, St. Louis, Mo.
D. T. Vail, Cincinnati, Ohio.
J. M. Ingersoll, Cleveland, Ohio.
H. L. Myers, Norfolk, Va.
E. M. Holmes, Boston, Mass.
B. E. Fryer, Kansas City, Mo.
K. Pischel, San Francisco, Cal.
J. E. Logan, Kansas City, Mo.
W. C. Phillips, New York, N. Y.
E. B. Dench, New York, N. Y.
J. A. Stucky, Lexington, Ky.
R. Levy, Denver, Colo.
M. A. Goldstein, St. Louis, Mo.
J. Beck, Chicago, Ill.
J. F. Barnhill, Indianapolis, Ind.
C. P. Jones, Newport News, Va.
J. J. Kyle, Indianapolis, Ind.
F. E. Miller, New York, N. Y.
W. S. Bryant, New York, N. Y.
W. L. Ballenger, Chicago, Ill.
E. W. Fleming, Los Angeles, Cal.
N. H. Pierce, Chicago, Ill.
D. B. Kyle, Philadelphia, Pa.
E. W. Day, Pittsburg, Pa.
H. B. Ellis, Los Angeles, Cal.
G. Hudson Makuen, Philadelphia.

An address of welcome by Hon. Henry M. Beardsley, Mayor of Kansas City, Mo., was warmly received, and ably responded to by Dr. J. A. Stucky, of Lexington, Ky.

The meeting was then declared open, and upon motion, seconded and carried, it was the wish of the Society that visiting members of the profession be invited to take part in the discussions.

The President, Dr. James E. Logan, Kansas City, Mo., read the annual address.

Excellent reports were received from the four sections of the Society, the Eastern, Middle, Western and Southern.

The reports of the Library and the Publication Committees was then read, accepted and placed on file.

REPORT OF LIBRARY COMMITTEE.

The American Laryngological, Rhinological and Otological Society—

The Library Committee begs to present the following report:

At a meeting held in November, 1905, at the office of Dr. H. Holbrook Curtis, Dr. Philip D. Kerrison was elected Secretary and Dr. H. Holbrook Curtis, Librarian.

It was decided, agreeable to the approval of the Council and the appropriation of the requisite funds, that the reprints already on hand should be properly card catalogued and that contributions of reprints should be solicited from physicians working in the specialties represented by this Society.

The approval of the Council was obtained, and in addition to the several hundred reprints on hand, some eight hundred others were received in response to a request sent out. These have all been card catalogued according to subject and author. Much credit for accomplishing this work is due to a fellow-member, Dr. Hampton P. Howell, who has given to it much time.

The Committee recommends that these reprints be placed at the disposal of the members of the Society under suitable rules and regulations to be established by the Committee with the approval of the Council.

Respectfully submitted,

THOMAS J. HARRIS,
Chairman.

REPORT OF THE PUBLICATION COMMITTEE.

The Publication Committee begs to present the following report:

On account of the extremely attractive offer made, namely, $260 for the 600 bound volumes, the contract for the publication of the Transactions was awarded to the Annals of Otology. The distance of the printing office from the headquarters of the Publication Committee was so great as to interfere somewhat with the early appearance of the volume. For this and the slightly diminished height of the volume, the committee offers its sincere apologies. By this time we trust that the volume is in the hands of every member who is entitled to it. The Transactions represent a volume of 570 pages—140 pages more than the volume of last year.

THOMAS J. HARRIS,
W. H. HASKIN.

The presentation of instruments and specimens then took place, after which followed the reading of the papers assigned for the morning.

It was moved and seconded, and carried, that the President's address be referred to the Council, who will take up the valuable suggestions made by the President, and that the Council report back to the Society at some session of this meeting.

At 3:15 p. m. the Society met again and went into executive session.

The Secretary reported that the Council recommended for election as Fellows the following, all of whom have presented theses which have been approved: Charles R. C. Borden, Boston; W. A. Chisholm, New York City; Robert H. Craig, Montreal, Canada; W. S. Daly, Ogdensburg, N. Y.; Henry Gradle, Chicago, Ill.; Charles Graef, New York City; D. Walton Hall, Kansas City, Mo.; Hill Hastings, Los Angeles, Cal.; Halstead S. Hedges, Charlottsville, Va.; C. P. Jones, Newport News, Va.; J. S. Kirkendall, Ithaca, N. Y.; D. A. Kuyk, Richmond, Va.; Kaspar Pischel, San Francisco, Cal.; H. O. Reik, Baltimore, Md.; C. N. Spratt, Minneapolis, Minn.; D. T. Vail, Cincinnati, Ohio.

On motion, the Secretary was instructed to cast an affirmative ballot for the list of candidates as read, and they were declared duly elected.

Drs. J. M. Ingersoll, Cleveland, Ohio, and E. W. Fleming, Los Angeles, Cal., were appointed an auditing committee to audit the Treasurer's accounts.

The President then appointed the following as the Nominating Committee: Drs. C. W. Richardson, Washington, D. C.; D. Braden Kyle, Philadelphia, Pa.; Norval H. Pierce, Chicago, Ill.; H. Bert Ellis, Los Angeles, Cal.; E. B. Dench, New York City.

The business meeting adjourned at 4:15 p. m.

The Society then took up the scientific program.

At the executive session of the second day, the report of the Secretary was read and accepted.

The Treasurer's report was read and referred to the auditing Committee.

The minutes of the last meeting were, upon motion, seconded and carried, considered as having been read.

SECRETARY'S REPORT.

Following precedent, the Secretary herewith presents a copy of the Transactions of the Eleventh Annual Meeting. The volumes have already been distributed to the members, and also to the various libraries both at home and abroad.

The prizes offered by members of the Society for essays upon various topics have attracted considerable attention and favorable comment both at home and abroad.

At a meeting of the Council held at Syracuse, N. Y., February 10, 1906, the following resolution was presented and adopted:

"The American Laryngological, Rhinological and Otological Society holds for the encouragement of research a fund of $500, the whole or a portion of which may be awarded at the discretion of the Council, to any of the Society's members presenting an essay embodying original work in subjects pertaining to laryngology, rhinology or otology.

The Council reserves the right to make no award, if in its opinion the essays are of insufficient merit. All essays submitted must be anonymous, being designated by a motto or device, the writer's name and address accompanying the essay in a sealed envelope, inscribed with the same device or motto as the essay."

Two essays have been received by the Council. The first signed, "In Medias Res.," for the Kyle prize, and the second signed, "Rex," for the research fund of $500.

After careful consideration by the Council, it was voted that neither was of sufficient merit to receive favorable reward. It is to be hoped that several of our members will enter actively into the work along the lines which are to be encouraged by our research fund.

During the year the 130 copies of the Transactions, most of which had been damaged by fire and water, have been sorted and one-half of them repaired and rebound. At the present time the back numbers of the Transactions are stored in a fire-proof storage warehouse in New York City.

Attention is hereby called to a report of the Library Committee which shows that we are gradually accumulating a valable collection of reprints, periodicals and books.

During the past year there has been one death, Dr. H. Nelson Hoople, of Brooklyn, N. Y., on May 8, 1905.

Eight have resigned.

None has been dropped for non-payment of dues.

Of those elected to membership at the eleventh annual meeting, all have qualified.

Including those elected at the last annual meeting, we have a total membership of 267.

During the year four meetings of the Council have been held, the minutes of which are at the disposal of the Society.

WENDELL C. PHILLIPS, *Secretary.*

The Auditing Committee reported the Treasurer's report as correct and its report was accepted, placed on file and the committee discharged.

The Nominating Committee reported as follows:

President—Wendell C. Phillips, New York, N. Y.

Vice-President:

For Eastern Section—Frank B. Sprague, Providence, R. I.

Vice-President:

For Middle Section—J. M. Ingersoll, Cleveland, Ohio.

Vice-President:

For Western Section—W. C. Bane, Denver, Colo.

Vice-President:

For Southern Section—J. M. Ray, Louisville, Ky.

Secretary—Thomas J. Harris, New York, N. Y.

Treasurer—Ewing W. Day, Pittsburg, Pa.

Council—James E. Logan, Kansas City, Mo.; Frederick C. Cobb, Boston, Mass.; Norval H. Pierce, Chicago, Ill.; Lewis A. Coffin, New York, N. Y.; Thomas H. Halstead, Syracuse, N. Y.; James F. McKernon, New York, N. Y.; H. W. Loeb, St. Louis, Mo.; Charles W. Richardson, Washington, D. C.; D. Braden Kyle, Philadelphia, Pa.

Library Committee—H. Holbrook Curtis, New York, N. Y.; W. Sohier Bryant, New York, N. Y.; David G. Yates, New York, N. Y.; W. P. Brandegee, New York, N. Y.; P. D. Kerrison, New York, N. Y.

Publication Committee—Chevalier Jackson, Pittsburg, Pa.; W. H. Haskin, New York, N. Y.; John D. Richards, New York, N. Y.

It was decided that $1000 be drawn from the treasury and a sinking fund started, and if necessary to incorporate the Society.

It was also decided that the Council revise the Constitution and By-Laws and report at the next annual meeting.

At the executive session on the third day all the officers named by the Nominating Committee were elected unanimously. The President, Dr. Logan, appointed Drs. E. W. Fleming of Los Angeles and W. L. Ballenger of Chicago a committee to escort the President-elect, Dr. Wendell C. Phillips of New York, to the Chair.

It was moved, seconded and carried unanimously that a vote of thanks be offered the retiring President, Dr. James E. Logan and Mrs. Logan and his confreres in Kansas City for their cordial hospitality during the meetings of this Society.

There being no further business to come before the Society, it was declared adjourned at 1 p. m.

WENDELL C. PHILLIPS, *Secretary.*

EWING W. DAY, TREASURER, IN ACCOUNT WITH THE AMERICAN LARYNGOLOGICAL, RHINOLOGICAL, AND OTOLOGICAL SOCIETY.

	Dr.	
To balance from 1905	$1801.41	
" 19 initiation fees at $5	95.00	
" 5 dues for 1902-1903 at $5	25.00	
" 6 dues for 1903-1904 at $5	30.00	
" 71 dues for 1904-1905 at $10	710.00	
" 195½ dues for 1905-1906 at $10	1955.00	
Sale of transactions	24.85	$4641.26
	Cr.	
By vouchers:		
Expenses of annual meeting	$ 97.83	
Stenographer reporting meeting	153.50	
Expenses of Library Committee	46.73	
Expenses of Publication Committee	90.25	
Expenses of Secretary (1904-05) and Treasurer	260.76	
Printing transactions for 1903-04	912.34	
Binding old transactions damaged by fire	129.14	
Printing, stationery, postage, etc	180.60	
Miscellaneous items	56.45	
Section meetings:		
Southern section—Dr. H. L. Myers	25.00	
Western section—Dr. M. A. Goldstein	25.00	
Middle section—Dr. Thos. Hubbard	25.00	
Eastern section—Dr. T. H. Halstead	25.00	
Total expenditures 1905-1906	$2027.60	$2027.60
	2613.66	$2613.66
	$4641.26	

Accounts due the Society:

Members in arrears for 1 year, 20½ at $10	$ 205.00	
Members in arrears for 2 years, 25 at $20	500.00	
Total outstanding accounts	$705.00	

Members in arrears for 3 years and dropped from membership, 2—E. A. Kirkpatrick and Chas. E. Norton.

Accounts owed by the Society for 1905-1906, and unpaid:

Library Committee account	$ 100.00
Printing transactions 1905-1906	518.00
Secretaries account for 1905-1906	225.00
Research fund	500.00
Sinking fund	1000.00
	$2343.00
	2613.66
Available surplus	$270.66

June 1st, 1906. EWING W. DAY, Treasurer.

The above account audited and found correct.

J. M. INGERSOLL,
E. W. FLEMING,
Auditing Committee.

FELLOWS.

Abraham, Jos. H., 616 Madison Ave., New York.
Abrams, Alva E., 78 High St., Hartford, Conn.
Adams, John L., 38 E. 51st St., New York.
Alderton, Henry A., 142 Clinton St., Brooklyn, N. Y.
Allport, Frank, 92 State St., Chicago Ill.
Anderson, Willis S., Detroit, Mich.
Ard, F. C., 604 Park Ave., Plainfield, N. J.
Arnold, J. Dennis, 1296 Van Ness Ave., San Francisco, Cal.
Arrowsmith, Hubert, 170 Clinton St., Brooklyn, N. Y.
Atkinson, Wm. J., 111 N. Main St., Paterson, N. J.
Babbitt, James A., 112 S. 18th St., Philadelphia, Pa.
Ballenger, Wm. L., 100 State St., Chicago, Ill.
Bane, Wm. C., Commonwealth Bldg., 15th and Stout Sts., Denver, Colo.
Barnhill, John F., Indianapolis, Ind.
Battle, S. Westray, 13 Church St., Asheville, N. C.
Beck, Joseph, 100 State St., Chicago, Ill.
Berens, Bernard, 2014 Chestnut St., Philadelphia, Pa.
Berens, Conrad, 1707 Arch St., Philadelphia, Pa.
Berens, T. Passmore, 35 Park Ave., New York.
Birkett, Herbert S., 252 Mountain St., Montreal, Canada.
Black, James A., 406 Sutter St., San Francisco, Cal.
Bolton, Wm. J., 101 N. Los Robles Ave., Pasadena, Cal.
Booth, Burton S., 21 First St., Troy, N. Y.
Borden, Charles R. C., 223 Newberry St., Boston, Mass.
Braislin, W. C., 556 Washington Ave., Brooklyn, N. Y.
Brown, Price J., 37 Carlton St., Toronto, Ont., Canada.
Bryant, Wm. S., 57 W. 53rd St., New York.
Bulette, Wilbur W., 5th and Santa Fe Aves., Pueblo, Colo.
Burnett, Peter V., 170 Keap St., Brooklyn, N. Y.
Calhoun, A. W., 62 Marietta St., Atlanta, Ga.
Campbell, Wm. E., 606 Century Bldg., Atlanta, Ga.
Canfield, R. Bishop, Ann Arbor, Mich.
Chambers, Talbot R., 490 Jersey Ave., Jersey City, N. J.
Cheatham, Wm., 303 West Chestnut St., Louisville, Ky.
Chenery, Wm. E., 222 Huntington Ave., Boston, Mass.
Chisholm, W. Alexander, 236 W. 44th St., New York.

Christy, T. C., 717 Westinghouse Bldg., Pittsburg, Pa.
Clark, Joseph Payson, 409 Marlboro St., Boston, Mass.
Clemens, James B., 15 E. 48th St., New York.
Cline, L. C., 224 N. Meridian St., Indianapolis, Ind.
Clough, Herbert L., Bangor, Me.
Coakley, C. G., 53 West 56th St., New York.
Cobb, Frederic C., 11 Marlboro St., Boston, Mass.
Coffin, Lewis A., 156 W. 58th St., New York.
Coggleshall, Henry, 40 East 58th St., New York.
Cohen, J. Solis, 1824 Chestnut St., Philadelphia, Pa.
Collins, Burnett C., 645 St. Mark's Place, Brooklyn, N. Y.
Connell, J. C., 265 King St., Kingston, Ontario, Canada.
Corwin, Theodore, 5 West Park St., Newark, N. J.
Coolidge, A., 613 Beacon St., Boston, Mass.
Cott, George F., 85 N. Pearl St., Buffalo, N. Y.
Cox, Charles N., 257 Jefferson Ave., Brooklyn, N. Y.
Craig, Robert H., 186 Peel St., Montreal, Canada.
Crockett, Eugene A., 298 Marlboro St., Boston, Mass.
Crouch, J. Frank, 412 Cathedral St., Baltimore, Md.
Culbert, Wm. Ledlie, 54 E. 34th St., New York.
Culp, John F., 211 Locust St., Harrisburg, Pa.
Curtis, H. Holbrook, 118 Madison Ave., New York.
Dabney, Wm. R., 282 Front St., Marietta, Ohio.
Daly, Walter S., Ogdensburg, N. Y.
Day, Ewing W., 71 Westinghouse Bldg., Pittsburg, Pa.
Dench, Edward B., 17 West 46th St., New York.
Dessar, L. A., 156 West 58th St., New York.
Donnellan, Patrick S., 1028 Spruce St., Philadelphia, Pa.
Douglas, O. B., 26 Pleasant St., Concord, N. H.
Douthett, J. M., 609 Smith Block, Pittsburg, Pa.
Dudley, Wm. F., 32 Livingston St., Brooklyn, N. Y.
Dudley, Wm. H., 3 Center Square, Easton, Pa.
Duel, Arthur B., 254 Madison Ave., New York.
Dunn, John, 314 East Franklin Street, Richmond, Va.
Dye, Hobart S., 1404 L St. N. W., Washington, D. C.
Eagleton, Wells P., 15 Lombardy St., Newark, N. J.
Ellis, H. Bert, 245 Bradbury Bldg., Los Angeles, Cal.
Farrell, Thomas H., 236 Genessee St., Utica, N. Y.
Fetterolf, George, 238 S. 15th St., Philadelphia, Pa.
Fitzpatrick, T. V., 32 Garfield Place, Cincinnati, Ohio.
Fleming, Ernest W., 214 Bradbury Block, Los Angeles, Cal.
Franklin, W. Scott, San Francisco, Cal.

Freeman, Walter J., 1720 Locust St., Philadelphia, Pa.
Freudenthal, Wolff, 1003 Madison Ave., New York.
Fryer, Blencowe E., N. W. Cor. 9th and Cherry Sts., Kansas City, Missouri.
Gallaher, Thomas J., California Bldg., Denver, Colo.
Gibb, Joseph S., 1907 Chestnut St., Philadelphia, Pa.
Gildea, Patrick F., 2 Cascade Ave., Colorado Springs, Colo.
Goff, Waldo P., Clarksburg, W. Va.
Goldsmith, Perry G., Belleville, Ontario, Canada.
Goldstein, Max A., 3858 Westminster Place, St. Louis, Mo.
Gradle, Henry, 100 State St., Chicago, Ill.
Graddy, L. B., Wilcox Bldg., Nashville, Tenn.
Graef, Charles, 1076 Boston Road, New York.
Grant, Dundas, Cavandish Square W., London, England.
Grayson, Charles P., 251 S. 16th St., Philadelphia, Pa.
Greene, D. C., Jr., 12 W. Cedar St., Boston, Mass.
Griffin, Edwin H., 112 W. 45th St., New York.
Gruening, Emil, 36 E. 57th St., New York.
Haddock, Charles W., 14 Bartlett St., Beverly, Mass.
Hall, D. Walton, Bryant Bldg., Kansas City, Mo.
Halsted, Thomas H., 831 University Block, Syracuse, N. Y.
Harland, Wm. G. B., 323 S. 17th St., Philadelphia, Pa.
Harris, Thomas J., 117 E. 40th St., New York.
Hartz, Henry J., 27 Adams Ave., Detroit, Mich.
Haskin, Wm. H., 42 E. 41st St., New York.
Hastings, Hill, Braly Bldg., Los Angeles, Cal.
Hedges, Halsted S., Charlottesville, Va.
Hepburn, Neill J., 317 West 23rd St. New York.
Heryng, T., Warsaw, Russia.
Hinkel, F. W., 581 Delaware Ave., Buffalo, N. Y.
Holmes, Christian R., 8 East 8th St., Cincinnati, Ohio.
Holmes, Edgar, M., 531 Beacon St., Boston, Mass.
Hopkins, F. E., 25 Harrison Ave., Springfield, Mass.
Hopkins, Wm. E., 803 Sutter St., San Francisco, Cal.
Hubbard, Dwight L., 135 West 94th St., New York.
Hubbard, Thomas, 205 Ontario St., Toledo, Ohio.
Hurd, Lee M., 15 East 48th St., New York.
Hyatt, Frank, 1022 14th St., N. W., Washington, D. C.
Ingals, E. Fletcher, 34 Washington St., Chicago, Ill.
Ingersoll, John M., 50 Euclid Ave., Cleveland, Ohio.
Jack, F. L., 215 Beacon St., Boston, Mass.
Jackson, Chevalier, 430 Park Bldg., Pittsburg, Pa.

Jackson, Oliver H., 34 N. Main St., Fall River, Mass.
Joachim, Otto, 501 Macheca Bldg., New Orleans, La.
Joal, Joseph, Mont Dore, Puy de Dome, Paris, France.
Johnson, Walter B., 170 Broadway, Paterson, N. J.
Jones, Clarence Porter, 118 32nd St., Newport News, Va.
Karwowski, Constantine, Warsaw, Russia.
Keiper, George F., Lafayette, Ind.
Kenefick, Joseph A., 29 West 36th St., New York.
Kennon, Beverly R., 64 Granby St., Norfolk, Va.
Kent, J. L., 1101 Church St., Lynchburg, Va.
Kerrison, Philip D., 58 West 50th St., New York.
Kimball, Irving E., 717 Congress St., Portland, Maine.
Kirkendall, J. S., Ithaca, New York.
Knapp, Arnold, 26 West 40th St., New York.
Knowles, W. F., 220 Clarendon St., Boston, Mass.
Koyle, F. H., 199 Main St., Hornellsville, N. Y.
Kuyk, D. A., Richmond, Va.
Kyle, D. B., 1517 Walnut St., Philadelphia, Pa.
Kyle, John J., The Newton-Claypool Bldg., Indianapolis, Ind.
Lanfried, C. J., 124 Baronne St., New Orleans, La.
Law, Edward, London, England.
Lederman, M. D., 58 East 75th St., New York.
Leland, George A., 269 Boylston St., Boston, Mass.
Leonard, Z. L., 19 West 120th St., New York.
Lester, John C., 179 Schermerhorn St., Brooklyn, N. Y.
Levy, Robert, 300 California Bldg., Denver, Colo.
Lewis, Robert, Jr., 48 West 40th St., New York.
Lincoln, Wm. R., Lennox Bldg., Erie St. and Euclid Ave., Cleveland, Ohio.
Linhart, C. P., Hotel Vendome, Columbus, Ohio.
Loeb, H. W., 537 North Grand Ave., St. Louis, Mo.
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Losey, Clifford S., 31 Washington St., Chicago, Ill.
Lowman, John B., 142 Park Place, Johnstown, Pa.
Luc, 54 Rue de Verenne, Paris, France.
Lutz, Stephen H., 551 Madison St., Brooklyn, N. Y.
Mabon, John S., 721 Sandusky St., Allegheny, Pa.
MacCoy, Alex., 1338 Walnut St., Philadelphia, Pa.
Macintyre, John, Glasgow, Scotland.
MaKuen, G. Hudson, 1627 Walnut St., Philadelphia, Pa.
Malcolm, Percy E. D., 118 Madison Ave., New York.
Manson, Charles A., 2 West 94th St., New York.

Martin, A., Paris, France.
Martinez, Emilio, 32 Neptuno St., Havana, Cuba.
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Means, Charles S., 715 N. High St., Columbus, Ohio.
Mial, Leonidas L., 133 West 11th St., New York.
Miller, Frank E., 22 West 31st St., New York.
Miller, Lewis H., 109 Halsey St., Brooklyn, N. Y.
Milligan, Robert, Smith Block, 6th and Liberty, Pittsburg, Pa.
Mooney, James T., 393 Seventh St., Buffalo, N. Y.
Moore, Thomas W., 1048 Third Ave., Huntington, W. Va.
Morgenthau, George, 34 Washington St., Chicago, Ill.
Mosher, Harris P., 828 Beacon St., Boston, Mass.
Moss, Robert E., 133 Avenue C, San Antonio, Texas.
Moulton, W. B., Portland, Maine.
Moure, E. J., Bordeaux, France.
Mullins, John B., 1516 H St., Washington, D. C.
Munger, Carl E., Waterbury, Conn.
Murray, Gilbert D., 436 Wyoming Ave., Scranton, Pa.
Myers, Henry L., 151 Granby St., Norfolk, Va.
Myles, Robert C., 46 West 38th St., New York.
McAuliffe, G. B., 57 East 65th St., New York.
McCaw, James F., 35 Washington St., Watertown, N. Y.
McClelland, Lefferts A., 78 McDonough St., Brooklyn, N. Y.
McCoy, John J., 139 West 97th St., New York.
McGahan, Charles F., Aiken, S. C.
McKernon, James F., 62 West 52nd St., New York.
McKimmie, O. A. M., 330 N St., N. W., Washington, D. C.
McLaury, Frank H., 244 West 42nd St., New York.
McReynolds, John O., Frost Bldg., Dallas, Texas.
Norton, Charles E., 118 Lisbon St., Lewiston, Maine.
Norris, C. W., Lexington, Ky.
Off, Henry J., 121 S. 18th St., Philadelphia, Pa.
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Onodi, Adolph, Budapest, Hungary.
Oppenheimer, Seymour, 40 East 60th St., New York.
Packard, Francis R., 1831 Chestnut St., Philadelphia, Pa.
Page, Lafayette, 234 N. Meridian St., Indianapolis, Ind.
Park, J. Walter, 32 N. 2nd St., Harrisburg, Pa.
Parker, Edward F., 70 Hasell St., Charleston, S. C.
Patterson, James A., 805 N. Tejon St., Colorado Springs, Colo.
Payne, Redmond W., 135 Geary St., San Francisco, Cal.
Peete, C. H., Macon, Ga.

Phillips, Wendell C., 40 West 47th St., New York.
Pierce, Norval H., 31 Washington St., Chicago, Ill.
Pischel, Kaspar, San Francisco, Cal.
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Powell, Stephen C., Newport, R. I.
Poyet, George, 15 Rue Milan, Paris, France.
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Rae, John B., 616 Madison Ave., New York.
Ray, J. M., 423 Chestnut St., Louisville, Ky.
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Reuling, George, 103 Monument St., Baltimore, Md.
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Roberts, Wm. H., Pasadena, Cal.
Roe, John O., 28 Clinton Avenue N., Rochester, N. Y.
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Root, Arthur G., 218 State St., Albany, N. Y.
Ross, George T., 945 Dorchester St., Montreal, Canada.
Roy, Dunbar, Grand Opera House Block, Atlanta, Ga.
Sandels, C. C., Westinghouse Bldg., Pittsburg, Pa.
Schadle, J. E., 140 Lowry Arcade, St. Paul, Minn.
Schmiegelow, Prof. E., 15 Norregade, Copenhagen, Denmark.
Seiss, Ralph W., 213 S. 17th St., Philadelphia, Pa.
Sendziack, Warsaw, Poland.
Sharp, J. Clarence, 62 West 46th St., New York.
Shattuck, Warren S., Jr., 147 Clinton St., Brooklyn, N. Y.
Sheppard, J. E., 130 Montague St., Brooklyn, N. Y.
Shields, Wm. B., 303 N. Grand Ave., St. Louis, Mo.
Shorter, J. H., Macon, Ga.
Smith, Earle P., 75 Pratt St., Hartford, Conn.
Smith, Harmon, 44 West 49th St., New York.
Smith, S. MacCuen, 1700 Walnut St., Philadelphia, Pa.
Smith, W. Harvey, 250 Donald St., Winnepeg, Manitoba.
Smyth, Herbert E., 376 John St., Bridgeport, Conn.
Snow, Sargent F., 707 University Block, Syracuse, N. Y.
Solenberger, Amos R., 106 East St., Vrain Court, Colorado Springs, Colo.

Sondern, Paul F., 52 S. Fitzhugh St., Rochester, N. Y.
Sprague, Frank B., 27 Stewart St., Providence, R. I.
Spratt, Charles Nelson, 310 Syndicate Arcade, Minneapolis, Minnesota.
Steele, George E., 124 West 119th St., New York.
Stein, Otto Jacob, 100 State St., Chicago, Ill.
Sterrett, John Kennedy, 320 Smith Block, Pittsburg, Pa.
Stillman, F. L., 118 East Broad St., Columbus, Ohio.
Stout, George C., 34 S. 18th St., Philadelphia, Pa.
Stucky, J. A., The McClelland Bldg., Lexington, Ky.
Theisen, Clement F., 172 Washington Ave., Albany, N. Y.
Thigpen, C. A., 13 S. Perry St., Montgomery, Ala.
Thigpen, F. M., Pensacola, Fla.
Thompson, John A., 628 Elm St., Cincinnati, Ohio.
Thompson, J. C., 202 Ninth Ave., Pittsburg, Pa.
Thrasher, A. B., N. E. Cor. 7th and Race Sts., Cincinnati, O.
Trowbridge, D. H., Fresno, Cal.
Turnbull, Thomas, 835 Weaten Ave., Allegheny, Pa.
Turner, Logan, 27 Walker St., Edinburgh, Scotland.
Tyson, Henry Hawkins, 47 West 51st St., New York.
Vail, Derrick T., 24 East 8th St., Cincinnati, Ohio.
Vansant, Eugene L., 1929 Chestnut St., Philadelphia, Pa.,
Voislawsky, Antonie P., 128 West 59th St., New York.
Voorhees, Sherman, 408 N. Main St., Elmira, N. Y.,
Wagner, Henry L., 506 Sutter St., San Francisco, Cal.
Waterman, James S., 676 St. Marks Ave., Brooklyn, N. Y.
Webster, George A., 419 Boylston St., Boston, Mass.
Wells, Walter A., 1133 14th St., Washington, D. C.
White, James A., 200 East Franklin St., Richmond, Va.
Willetts, Joseph E., 30 Westinghouse Bldg., Pittsburg, Pa.
Wilson, Norton L., 410 Westminster Ave., Elizabeth, N. J.
Winslow, John R., 114 Franklin St., Baltimore, Md.
Wishart, D. J. Gibb, 47 Grosvenor St., Toronto, Canada.
Woakes, London, W., England.
Wolfenden, R. Norris, London, England.
Wood, George B., 129 S. 18th St., Philadelphia, Pa.
Woodward, John F., Norfolk, Va.
Yates, D. G., 67 West 104th St., New York.
Ziem, Prof. C. H., Danzig, Germany.

LIST OF OFFICERS.

Presidents.

1896. Edward B. Dench.
1897. Frank Hyatt.
1898. William H. Daly.
1899. S. E. Solly.
1900. D. Braden Kyle.
1901. Robert Cunningham Myles.
1902. Charles W. Richardson.
1903. J. A. Stucky.
1904. Norval H. Pierce.
1905. Frederic C. Cobb.
1906. James E. Logan.

Vice-Presidents.

1896. Joseph A. Dwyer.
1897. Frederick L. Jack.
1897. John S. Mabon.
1897. James E. Logan.
1897. William Scheppegrell.
1898. A. W. Calhoun.
1898. J. F. Schadle.
1898. J. A. Thompson.
1898. A. G. Root.
1899. Charles W. Richardson.
1899. Max Thorner.
1899. Henry L. Wagner.
1899. Charles A. Thigpen.
1900. Robert Levy.
1900. J. A. Stucky.
1900. G. Hudson MacKuen.
1900. Howard S. Straight.
1901. W. Scott Renner.
1901. Norval H. Pierce.
1901. Joseph A. White.
1901. John O. McReynolds.

1902. H. Holbrook Curtis.
1902. H. W. Loeb.
1902. Charles F. McGahan.
1902. F. W. Fleming.
1903. Frederic C. Cobb.
1903. Lewis C. Cline.
1903. Dunbar Roy.
1903. P. F. Gildea.
1904. George L. Richards.
1904. Chevalier Jackson.
1904. John F. Woodward.
1904. Redmond W. Payne.
1905. S. MacCuen Smith.
1905. Thomas Hubbard.
1905. Max A. Goldstein.
1905. Wm. Cheatham.
1906. Thomas H. Halsted.
1906. William L. Ballenger.
1906. H. Bert Ellis.
1906. Henry L. Myers.

Secretaries.

1895. Robert Cunningham Myles.
1900. Wendell C. Phillips.

Treasurer.

1900. Ewing W. Day.

Deceased Members.

1895. D. S. Hengst, Pittsburg, Pa.
1895. J. E. Nichols, New York.
1895. Joseph O'Dwyer, New York.
1895. J. L. Noyes, Providence, R. I.
1895. Max Thorner, Cincinnati, Ohio.
1895. Dillon Brown, New York.
1896. W. McNeill Whistler, London.
1897. D. N. Rankin, Allegheny, Pa.
1898. Woolsey Hopkins, New York.

1898. Ralph J. Wenner, Cleveland, Ohio.
1901. Wm. H. Daly, Pittsburg, Pa.
1902. Achille Goughenhein, Paris, France.
1902. Joseph Gruber, Vienna.
1903. S. Hartwell Chapman, New Haven, Conn.
1903. Edward Fridenburg, New York.
1903. A. B. Kibbe, Seattle, Wash.
1904. Sir Philip Smyly, Dublin, Ireland.
1905. H. Nelson Hoople, Brooklyn, N. Y.
1906. Wm. P. Brandegee, New York.
1906. S. E. Solly, Colorado Springs, Col.

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